MONTHLY WEATHER REVIEW.

Editor: Prof. Cleveland Abbe.

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INTRODUCTION.

The Review for September, 1896, is based on 2,746 reports from stations occupied by regular and voluntary observers, classified as follows: 149 from Weather Bureau stations; 33 from U. S. Army post surgeons; 2,421 from voluntary observers; 33 from Canadian stations; 1 from Hawaii; 96 received through the Southern Pacific Railway Company; 14 from U. S. Life-Saving stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

The Weather Review is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the statistical tables are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data. Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada, Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu, and of Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

During the current month the average pressure was slightly above normal on the northern and eastern slope of the Rocky Mountains, as also in Nova Scotia, Newfoundland, and Bermuda. The temperature was slightly above normal in the South Atlantic and Gulf States and southern Plateau Region. The mean temperature was the lowest on record at Rapid City, Sioux City, and La Crosse. The precipitation was decidedly above normal in the Ohio Valley, Illinois, on Lake Michigan, the Lower Lakes, and the coasts of New England and Nova Scotia. Considerable snow was reported from Montana and Colorado. The principal storms of the month were the two hurricanes that passed northward along the Atlantic Coast on the 5–10th and 28–30th. Hot, dry weather has injuriously affected the crops in a few States.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The *mean pressures* during the current month were high on the Atlantic Coast and in northwestern Washington and low in Arizona.

The highest pressures were: Bermuda, 30.12; Halifax, 30.09; Lynchburg, 30.08; Charleston and Parkersburg, 30.07. The lowest were: Yuma, 29.76; Phœnix, 29.80; Fresno, 29.34.

As compared with the normal for September, the mean pressure was in excess in the upper Mississippi and Missouri valleys, as also in Bermuda, Nova Scotia, and Newfoundland. It was deficient in California and the Gulf and Atlantic States. The greatest excesses were: Edmonton, 0.13; Miles City, 0.10; Calgary and Helena, 0.09. The greatest deficits were: Roseburg, Sacramento, Baltimore, Harrisburg, and Nantucket, 0.06.

As compared with the preceding month of August, the pressures, reduced to sea level, show a rise over the northern and eastern Rocky Mountain Slope, the Lake Region, and New England, but a fall in the South Atlantic and Gulf States and on the Pacific Coast. The greatest rises were: Calgary, 0.09; Helena, Havre, and Battleford, 0.08. The greatest falls were: Jupiter, 0.11; Key West, 0.10; Tampa and San Diego, 0.09; Galveston and Eureka, 0.08.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. Hazen.

During the month seven high and eleven low areas have had sufficiently well defined trajectories to be charted. Their paths will be found on Charts I and II, together with the pressure at the position of center twice each day. The accompanying table gives the place of origin and also of disappearance, the length and duration of the path, and the velocity of each high and low pressure area. The high areas took a much more southerly average path than in August, while most of the low areas were just on the northern border of the region of observation. Three of the highs originated to the north of Montana and the other four off the north Pacific Coast. One of the highs finally merged with a rather permanent high in the Gulf Region, a second was last seen off the middle Atlantic Coast, and the remaining five disappeared off Nova Scotia.

Of the lows Nos. II, III, VII, VIII, IX, and X started to the north of Montana and moved nearly due east; No. I began in Montana and moved east; No. V began in South Dakota and moved a little south of east; No. VI was first noted northwest of Lake Superior and moved east.

No. IV was a well developed West India hurricane which,

however, only touched the country on the southeast point of New England. One of the ocean steamers that was caught in this storm has forwarded a barograph sheet showing the central depression on the 6th, when a reading of 28.50 inches was reached. This sheet is reproduced on a later page. On the morning of the 5th a report was received from Nassau, Bahama Islands, stating that a disturbance was forming near there. Its path was just half way between Bermuda and North Carolina. No effects from this storm were felt on the Atlantic Coast till the afternoon of the 7th when the observer at Hatteras hoisted his northeast signal. On the morning of the 8th the wind reached 34 miles at Hatteras, and at night the maximum wind was 36 miles at that station. At 9.30 p. m. of the 8th storm northeast signals were hoisted from New York City along the southern New England coast. By 1 p. m. of the 9th the storm had advanced sufficiently to warrant hurricane signals from Montauk Point, Long Island, to Portland, Me. During the afternoon of the 9th a maximum wind of 76 miles was reached at Block Island, which was the highest reported at any land station. On the a. m. of the 10th the storm had lost some energy, and by night it was almost entirely replaced by a high area over Nova Scotia.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Duration.	Length.	Daily.	Hourly.
High areas.		°	°		°	°	*Days.*	*Miles.*	*Miles.*	*Miles.*
I*										
II	2, a. m.	54	108	6, a. m.	46	59	2,700	4.0	675	28.1
III	3, a. m.	49	124	10, a. m.	44	59	3,750	7.0	536	22.3
IV	7, p. m.	50	126	14, a. m.	47	62	3,880	6.5	596	24.8
V	12, p. m.	54	113	16, a. m.	47	72	1,940	3.5	554	23.1
VI	15, p. m.	44	124	21, a. m.	36	78	3,600	5.5	655	27.3
VII	20, a. m.	54	110	26, a. m.	48	55	4,100	6.0	683	28.5
VIII	24, a. m.	45	125	30, p. m.	30	89	2,920	6.5	449	18.7
Sums							22,900	39.0	4,148	
Mean of 7 paths									593	24.7
Mean of 39 days									587	24.5
Low areas.										
I	1, a. m.	47	106	4, a. m.	47	60	2,270	3.0	757	31.5
II	3, a. m.	51	113	7, a. m.	50	69	2,100	4.0	525	21.9
III	5, a. m.	53	118	9, p. m.	36	102	1,940	4.5	432	18.0
IV	5, a. m.	26	78	10, a. m.	42	71	1,270	5.0	254	10.6
V	13, p. m.	43	98	16, a. m.	37	74	2,020	2.5	808	33.7
VI	16, p. m.	50	91	19, a. m.	49	53	1,820	2.5	730	30.4
VII	17, p. m.	53	104	20, a. m.	47	57	2,150	2.5	859	35.8
VIII	19, p. m.	54	110	23, a. m.	46	58	3,130	4.0	782	32.6
IX	22, a. m.	54	115	26, p. m.	49	71	2,430	4.5	540	22.5
X	26, p. m.	55	111	29, a. m.	52	98	980	2.5	392	16.3
XI	26, p. m.	23	84	30, p. m.	48	80	2,210	4.0	552	23.0
Sums							22,330	39.0	6,631	
Mean of 11 paths									603	25.1
Mean of 39 days									572	23.8

*No. VI of August; noted for thirty-six hours only.

The most notable storm of the month was reported near the northwest edge of Cuba p. m. of 26th. An area of high pressure remained nearly stationary off the middle Atlantic Coast for two days and this prevented a rapid development of the storm. By a. m. of 28th the wind had shifted to southeast at Key West, showing that the storm had moved to the southwest coast of Florida. By a. m. of the 29th it had moved to southeast Georgia, increasing rapidly in intensity. By 8 p. m. of the 29th the storm had moved with great rapidity and was central over Lynchburg, Va., which station reported a barometer reading of 29.30 inches. About three hours later occurred the severest storm or "wind-rush" ever experienced in Washington, D. C., a description of which will be found elsewhere. On the a. m. of the 30th the storm had moved to Lower Michigan. Storm and hurricane signals were ordered along the Atlantic Coast in ample time, thus detaining in the harbors along the coast sailing and steam vessels valued in the aggregate at over $7,000,000, some of which might have been lost but for the warning. On board these vessels there were about 1,750 sailors and passengers. A full description of the damage wrought by the storm in Florida and along the south Atlantic Coast will be found under severe storms.

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The noteworthy features of the month were the severe thunderstorms of the 17th in eastern Pennsylvania and New Jersey, the high easterly winds over northeastern Utah on the night of the 18th, and the very severe West India hurricane of the 29–30th.

Three small tornadoes occurred during the month. No lives were lost and the total loss of property was quite small. The details are given below:

4th.—A severe local storm was reported as having destroyed farm property near Caldwell, Kans. An incipient tornado passed through the suburbs of Yorkville, S. C., at 5 p. m., eastern time; no casualties; property loss about $1,500; path half-mile wide and about 2 miles long; moved to the west. A severe thunderstorm swept over Baltimore and vicinity. Two lives were lost by the capsizing of small boats. The damage to dwellings and other property amounted to about $3,000. A destructive hailstorm passed over Weir City, Kans., at 7 p. m. Press dispatches state that glass valued at $10,000 was broken. Hailstorms were also reported in Missouri on the same date.

5th.—A tornado passed over the small hamlet of Waltersburg, Pa., about 7 p. m., eastern time; 4 persons were injured; property loss about $12,000; path 1,500 feet wide, and from 8 to 10 miles long; moved northeast.

10th.—Violent easterly gales prevailed on the New England coast, and as far south as New Jersey; small craft were wrecked at various points and considerable damage was done to property on the beaches.

16th.—A small tornado passed through the eastern part of Lucas and into Monroe Co., Iowa, on the 16th; further particulars are awaited.

17th.—Violent thunder and hailstorms prevailed throughout eastern Pennsylvania and New Jersey. The property loss was quite heavy, probably not less than $50,000.

18th.—On the evening of the 18th the pressure distribution over the Rocky Mountain Plateau was such as to cause high winds, in some cases attaining the velocity of a gale, over the greater part of northeastern Utah. In Cache, Weber, and Davis counties houses were unroofed, plate glass windows blown in, shade trees, signs, and awnings demolished, and orchards badly damaged. The damage in these three counties, at a conservative estimate, was not less than $75,000. At Ogden, where the wind was particularly severe, there was no rain; in other portions of the area covered by the high winds the rain was light.

19th. Severe local thunderstorms occurred throughout the eastern portion of the Middle Atlantic States on the evening of the 19th.

29–30th.—One of the severest West India hurricanes ever experienced struck the Florida coast at Cedar Keys about 3.30 a. m., September 29. It passed thence to Lake Ontario and the St. Lawrence Valley in twenty-four hours at a rather uniform rate of about 46 miles per hour. As is usual in storms of this class the path of relatively great destruction was quite narrow, not extending over 50 miles at any part of its course.

The storm pursued a northeasterly direction through Florida and Georgia. When near Savannah it seemed to curve slightly to the northward, passing thence almost due north to the St. Lawrence Valley.

The force of the wind varied greatly within quite narrow limits; places 50 to 100 miles on either side of the central path were not exposed to winds of unusual severity. The violence of the storm in the central portion also varied with time and place. The greatest violence was manifested in Florida during the early morning of the 29th. During the daylight hours of the same date, particularly in the afternoon, when the influence of the diurnal change in wind velocity might be expected to accelerate the movement of the storm winds, the violence of the latter seemed to diminish.

The second period of great violence began in Virginia about 9 p. m., and continued until a little after midnight when the storm had reached central Pennsylvania. There was then another lull in the violence of the storm, and a subsequent renewal of intensity during the early morning of the 30th at Syracuse, and other points in Cayuga and Cortland counties, New York.

The rainfall in the center and on the eastern side of the hurricane's path was quite light as compared with that to the westward, and the rainfall in Florida, Georgia, and South Carolina was also light as compared with the fall farther north. The rainfall in a strip of country extending from North Carolina to the southern border of Pennsylvania, probably 100 miles wide and about the same distance west of the storm center, was exceedingly heavy, 5 and 6 inches being recorded at some stations, and 3 to 4 at others. As the storm reached central New York, the rain area spread far to the westward and the violence of the winds diminished.

The form and color of the clouds as observed in Washington during the early part of the storm greatly resembled ground fog driven by a high wind. They were very low, scarcely above the house tops, and of a pure white. With the shift of wind from southeast to south and southwest the form and color of the clouds changed, but the darkness soon became so intense that further observations could not be made. The display of atmospheric electricity was almost continuous, and in the form of broad, diffuse flashes, though not of marked brilliancy or intensity. The flashes were very similar to the well known phenomenon of sheet lightning in summer. There was no thunder at Washington. Thunder and lightning were not observed elsewhere in the storm's path except at a very few places.

The loss of life and property is summarized below:

State.	Loss of life.	Loss of property.
Florida	68	$2,225,000
Georgia	25	933,000
South Carolina	5	25,000
North Carolina	0	20,000
Virginia	5	695,000
District of Columbia	1	443,000
Maryland	8	500,000
Pennsylvania	2	2,140,000
New York	0	50,000
Total	114	$7,031,000

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperature is given for each station in Table II, for voluntary observers. Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the Weather Bureau.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean* temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau Region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *highest mean temperatures* were: Yuma, 84.0; Phœnix, 82.9; Key West, 82.0; Jupiter, 80.6; Galveston, 80.2. The lowest temperatures were: Sault Ste. Marie, 51.6; Helena, 51.8; Williston, 52.8; Havre, 52.4; Tatoosh Island, 52.0. Among the Canadian stations the highest were: Kingston, 57.6; Halifax, 58.0. The lowest were: Banff, 43.2; Prince Albert, 45.4.

As compared with the normal for September the mean temperature for the current month was in excess in the South Atlantic and Gulf States and the Canadian Provinces. It was deficient on the Atlantic Coast, the Missouri Valley, and Lake Region. The greatest excesses were: Palestine, 3.8; Atlanta, 3.2; Columbia, S. C., 2.6; Phœnix, 2.1. The greatest deficits were: Sioux City, 6.2; Minneapolis, 4.5; La Crosse, 4.9; Helena and Miles City, 4.8; Sault Ste. Marie, 4.4.

Considered by districts the mean temperatures for the current month show departures from the normal as given in Table I. The greatest positive departures were: South Atlantic, 1.3; East Gulf, 1.2; West Gulf, 1.7. The greatest negative departures were: Upper Mississippi, 2.9; Missouri Valley, 2.5; northern Slope, 3.2.

The *years of highest and lowest mean temperature* for September are shown in Table I of the REVIEW for September, 1894. The mean temperature for the current month was not the highest on record at any regular station of the Weather Bureau. It was the lowest on record at: La Crosse, 55.5; Rapid City, 56.7; Sioux City, 58.5.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 108, Yuma (15th); 104, Phœnix (4th), Columbia, S. C. (18th), Palestine (5th); 102, Fort Smith (17th); 101, Fresno (6th), Dodge City (8th), and Augusta (18th); 100, Red Bluff (5th), Oklahoma (7th), San Antonio (5th). The lowest maxima were: 68, Tatoosh Island (4th) and Eureka (10th); 70, Point Reyes Light (6th); 72, Sault Ste. Marie (8th); 73, Eastport (11th). The highest minima were: 72, Key West (19th); 71, Jupiter (11th); 62, Tampa (24th); 61, Galveston (28th); 60, Port Eads (frequently). The lowest minima were: 19, Cheyenne (27th); 22, Bismarck (19th); 24, Huron (19th), Lander (27th), Idaho Falls (27th); 26, Williston (19th).

The *years of highest maximum and lowest minimum temperatures* are given in the last four columns of Table I of the current REVIEW. During the present month the maximum temperatures were the highest on record at: Columbia, S. C., and Palestine, 104; Fort Smith, 102; Dodge City and Augusta, 101; Little Rock, 100; Charlotte and Nashville, 99; Raleigh and Chattanooga, 98; Savannah, Atlanta, and Cairo, 97; Lexington, 95; Tampa, 94; Northfield, 90; Fort Canby, 89; Port Angeles, 78. The minimum temperatures were the lowest on record at: Cheyenne, 19; Alpena, 28; Sault Ste. Marie, 29; Buffalo, 35; Amarillo, 38; Little Rock and Memphis, 41; Columbia, S. C., Vicksburg, and Abilene, 42; Shreveport, 45; Palestine, 47; Mobile, 49; New Orleans, 56; Tampa, 62.

The *greatest daily range of temperature and data for computing the extreme and mean monthly ranges* are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: Miles City, 50;

Havre, 49; Roseburg, 48; Bismarck and Winnemucca, 46; Pierre, Idaho Falls, Carson City, and San Luis Obispo, 45. The smallest values were: Hatteras, Key West, and Galveston, 14; Jupiter, 15; Nantucket, Block Island, and Tatoosh Island, 16; Eastport and Kittyhawk, 19; Charleston and Point Reyes Light, 20.

Among the *extreme monthly ranges* the largest were: Bismarck and Huron, 71; Pierre, 70; Moorhead, 68; Williston and Cheyenne, 64. The smallest values were: Key West, 18; Jupiter, 19; Point Reyes Light, 21; Eureka, 25; Tatoosh Island and San Diego, 26.

The *accumulated monthly departures* from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
Middle Atlantic	+ 4.7	+ 0.5	New England	− 0.1	− 0.0
South Atlantic	+11.5	+ 1.3	Florida Peninsula	−11.1	− 1.2
East Gulf	+ 2.9	+ 0.3			
West Gulf	+13.0	+ 1.4			
Ohio Valley and Tenn	+11.0	+ 1.2			
Lower Lake	+ 9.5	+ 1.1			
Upper Lake	+20.7	+ 2.3			
North Dakota	+ 5.0	+ 0.6			
Upper Mississippi	+19.0	+ 2.1			
Missouri Valley	+18.9	+ 2.1			
Northern Slope	+ 6.2	+ 0.7			
Middle Slope	+24.2	+ 2.7			
Abilene (southern Slope)	+25.6	+ 2.8			
Southern Plateau	+ 6.5	+ 0.7			
Middle Plateau	+ 0.8	+ 0.1			
Northern Plateau	+15.3	+ 1.7			
North Pacific	+ 1.9	+ 0.2			
Middle Pacific	+ 0.6	+ 0.1			
South Pacific	+ 2.9	+ 0.3			

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-point for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, is given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer; an evaporometer may be so constructed as to give the *quantity* of water evaporated from a similar surface during any interval of time. Such an evaporometer, therefore, would sum up or integrate the effects of those influences that determine the temperature as given by the wet bulb; from this quantity the *average humidity of the air* during any given interval of time may be deduced.

Measurements of evaporation within the thermometer shelters are difficult to make so as to be intercomparable at temperatures above and below freezing, and they may be replaced by computations based on the wet-bulb temperatures. The absolute amount of evaporation from natural surfaces not protected from wind, rain, sunshine, and radiation, are being made at a few experimental stations and will be discussed in special contributions.

Sensible temperatures.—The sensation of temperature experienced by the human body and ordinarily attributed to the condition of the atmosphere depends not merely on the temperature of the air, but also on its dryness, on the velocity of the wind, and on the suddenness of atmospheric changes, all combined with the physiological condition of the observer. A satisfactory expression for the relation between atmospheric conditions and nervous sensations has not yet been obtained.

PRECIPITATION.

[In inches and hundredths.]

The *distribution of precipitation* for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The total precipitation for the current month was heaviest, viz, above 8 inches, in a small region on the southern peninsula of Florida; in central Texas; on the coast of Nova Scotia near Halifax, and the coasts of Massachusetts and Maine.

The larger values at regular stations were: Halifax, 12.1; Port Eads, 10.7; Portland, Me., 9.6; Block Island, 7.8; Bermuda, 7.2.

Details as to *excessive precipitation* are given in Tables XII and XIII.

The *diurnal variation*, as shown by tables of hourly means of the total precipitation, deduced from self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was in excess over the lower Lake Region, the Ohio, Mississippi, and Missouri valleys, the eastern Rocky Mountain Slope, New England, and the Canadian Provinces. It was deficient on the Pacific Coast and in the Gulf and South Atlantic States. The large excesses were: Halifax, 8.6; Portland, Me., 6.5; Block Island, 4.8; Port Eads, 4.5. The large deficits were: Jacksonville, 6.2; Tatoosh Island, 5.7; Jupiter, 4.1; Savannah and Galveston, 4.0.

The *average departure* for each district is given in Table I. By dividing each current precipitation by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: New England, 172; Ohio Valley and Tennessee, 141; lower Lake, 138; upper Lake, 126; North Dakota, 129; Upper Mississippi, 128; Missouri Valley, 116; northern Slope, 182; middle Slope, 123; southern Slope, 143; southern Plateau, 138.

Normal: West Gulf, middle Plateau, and middle Pacific, 100.

Below the normal: Middle Atlantic, 92; south Atlantic, 53; Florida Peninsula, 76; east Gulf, 74; northern Plateau, 31; north Pacific, 38; south Pacific, 17.

The *total accumulated monthly departures* from normal precipitation from January 1 to the end of the current month are given in the second column of the following table; the third column gives the ratio of the current accumulated precipitation to its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
Lower Lake	+ 3.60	114	New England	− 2.70	92
North Dakota	+ 1.50	109	Middle Atlantic	− 3.10	91
Upper Mississippi	+ 1.70	106	South Atlantic	− 9.80	78
Missouri Valley	+ 0.20	101	Florida Peninsula	− 2.00	95
Northern Slope	+ 0.70	106	East Gulf	− 8.20	82
Southern Plateau	+ 0.60	110	West Gulf	− 9.70	71
Middle Plateau	+ 3.10	136	Ohio Valley and Tenn	− 2.30	94
North Pacific	+ 2.60	107	Upper Lakes	− 1.30	95
Middle Pacific	+ 2.80	114	Middle Slope	− 2.10	89
			Abilene (southern Slope)	− 5.20	74
			Northern Plateau	− 0.50	96
			South Pacific	− 2.00	76

The *years of greatest and least precipitation* for September are given in the REVIEW for September 1890. The precipita-

tion for the current month was the greatest on record at: Portland, Me., 9.57; Indianapolis, 8.17; Block Island, 7.76; Rapid City, 2.58; Pueblo, 1.41. It was not the least on record at any regular station of the Weather Bureau.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 11. California, 6, 22. Colorado, 2, 3, 7, 9, 17, 21, 22, 24. Connecticut, 19. Georgia, 4. Idaho, 22, 23. Illinois, 2, 5, 14, 16, 18, 19, 26, 28. Kansas, 4, 8, 24. Kentucky, 17, 18, 24. Maryland, 20. Massachusetts, 9, 19. Michigan, 12. Mississippi, 12. Missouri, 4, 5, 16, 17, 18, 20, 27. Montana, 22. New Jersey, 3, 17, 19. New Mexico, 17, 23. New York, 17, 19. North Carolina, 11, 12, 19. North Dakota, 1, 12, 14, 15, 18. Ohio, 5. Pennsylvania, 17. Rhode Island, 17. South Dakota, 16. Tennessee, 19. Utah, 1, 8, 9, 11, 22 to 25. Virginia, 3, 18. Washington, 12, 15. West Virginia, 19. Wyoming, 25.

SLEET.

The following are the dates on which sleet fell in the respective States:

California, 22. Colorado, 9, 18, 26. Michigan, 18, 19, 21. Minnesota, 18. Missouri, 28. Montana, 8, 15, 25, 26. New Hampshire, 24.

WIND.

The *prevailing winds* for September, 1896, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

HIGH WINDS.

Maximum wind velocities of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Block Island, R. I	9	75	ne.	Hatteras, N. C	23	51	n.
Do	10	60	ne.	Jacksonville, Fla	29	70	se.
Do	13	51	ne.	Kittyhawk, N. C	23	58	ne.
Buffalo, N. Y	6	50	sw.	Do	30	55	sw.
Do	19	57	w.	Lexington, Ky	30	56	sw.
Do	30	52	sw.	Nantucket, Mass	9	50	e.
Charleston, S. C	29	62	s.	Do	10	55	s.
Cleveland, Ohio	19	54	w.	New York, N Y	30	56	se.
Fort Canby, Wash	30	52	s.	Savannah, Ga	29	70	se.
Harrisburg, Pa	30	72	s.	Washington, D. C	29	66	se.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 19 regular stations of the Weather Bureau by its photographic, and at 24 by its thermal effects. At one station records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table XI for each hour of local mean time.

Photographic and thermometric registers give the duration of that intensity of sunshine which suffices to make a record, and, therefore, they generally fail to record for a short time after sunrise and before sunset, because, even in a cloudless sky, the solar rays are then too feeble to affect the self-registers. If, therefore, such records are to be used for determining the amount of cloudiness, they must be supplemented by special observations of the sky near the sun at these times. The duration of clear sky thus specially determined constitutes the so-called twilight correction (more properly a low-sun correction), and when this has been applied, as has been done in preparing Table XI, there results a complete record of the clearness of the sky from sunrise to sunset in the neighborhood of the sun. The twilight correction is not needed when the self-registers are used for ascertaining the duration of a special intensity of sunshine, but is necessary when the duration of cloudiness is alone desired, as is usually the case.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table XI.

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		Hrs.	%	%	%	%	%
Bismarck, N. Dak	P.	376.9	56	57	+ 1	.....	.....
Helena, Mont	P.	376.9	54	60	+ 6	.....	.....
Portland, Oreg.*	P.	376.1	65	63	− 2	.....	.....
	T.	376.1	65	.....	.....	63	− 2
Eastport, Me	P.	375.8	31	42	+ 9	.....	.....
Minneapolis, Minn	T.	375.8	.....	.....	.....	53	.....
Northfield, Vt	P.	375.4	37	43	+ 6	.....	.....
Portland, Me	T.	375.4	35	.....	.....	50	+15
Buffalo, N. Y	T.	375.0	42	.....	.....	56	+14
Rochester, N. Y	T.	375.0	42	.....	.....	49	+ 7
Boston, Mass	T.	374.5	42	.....	.....	51	+ 9
Chicago, Ill	T.	374.5	45	.....	.....	56	+11
Cleveland, Ohio	P.	374.5	39	.....	.....	.....	.....
Des Moines, Iowa	T.	374.5	48	.....	.....	51	+ 3
Dubuque, Iowa †	T.	374.5	39	.....	.....	.....	.....
Detroit, Mich	T.	374.5	48	.....	.....	58	+10
Cheyenne, Wyo	P.	374.0	45	61	+16	.....	.....
Eureka, Cal	P.	374.0	44	48	+ 4	.....	.....
New York, N. Y	T.	374.0	48	.....	.....	49	+ 1
Omaha, Nebr. †	P.	374.0	52	61	+ 9	.....	.....
Salt Lake City, Utah	P.	374.0	52	81	+29	.....	.....
Columbus, Ohio	T.	373.6	32	.....	.....	39	+ 7
Denver, Colo	P.	373.6	55	63	+ 8	.....	.....
Philadelphia, Pa	T.	373.6	47	.....	.....	64	+17
Baltimore, Md	T.	373.4	50	.....	.....	54	+ 4
Cincinnati, Ohio	T.	373.4	49	.....	.....	68	+19
Kansas City, Mo	P.	373.4	47	52	+ 5	.....	.....
St. Louis, Mo	T.	373.4	46	.....	.....	60	+14
Washington, D. C	P.	373.4	59	60	+ 1	.....	.....
Dodge City, Kans	P.	373.0	58	66	+ 8	.....	.....
Louisville, Ky	T.	373.0	48	.....	.....	58	+10
San Francisco, Cal	T.	373.0	56	.....	.....	61	+ 5
Fresno, Cal	T.	372.6	82	.....	.....	88	+ 6
Santa Fe, N. Mex	P.	372.2	60	68	+ 8	.....	.....
Little Rock, Ark	T.	372.0	61	.....	.....	73	+12
Atlanta, Ga†	T.	371.8	65	.....	.....	62	− 3
Wilmington, N. C	T.	371.8	70	.....	.....	81	+11
Phœnix, Ariz	P.	371.4	72	.....	.....	.....	.....
San Diego, Cal	P.	371.4	79	75	− 4	.....	.....
Savannah, Ga	P.	371.4	72	71	− 1	.....	.....
Vicksburg, Miss	T.	371.4	77	.....	.....	79	+ 2
New Orleans, La	T.	370.4	61	.....	.....	61	0
Galveston, Tex	P.	370.4	63	71	+ 8	.....	.....

* Record by both methods.

† The personal estimates are for 30 days but the instrumental records are for 28 days only, for which the total possible was 347.8 hours.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the duration relative to possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for September, 1896, is 7 per cent for photographic and 8 per cent for thermometric records.

The details are shown in the following table, in which the stations are arranged according to the greatest possible duration of sunshine, and not according to the *observed* duration as heretofore.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which reports of thunderstorms for the whole country were most numerous were: 3d, 208; 5th, 136; 12th, 147; 17th, 138; 18th, 150; 19th, 247.

Thunderstorm reports were most numerous in: Florida, 111; Illinois, 157; Massachusetts, 102; Missouri, 238; North Carolina, 127; Ohio, 109; Pennsylvania, 105.

Thunderstorm were most frequent in: Florida, 26 days; Illinois, 20; Missouri, 25; North Carolina and Texas, 21.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 17th to the 25th, inclusive. On the remaining twenty-one days of this month 35 reports were received, or an average of about 1.5 per day. The date on which the number of reports especially exceeded this average were: 4th, 7; 18th, 9; 30th, 10.

Auroras were reported by a large percentage of observers, in Minnesota and New Hampshire, 22; North Dakota, 26 per cent.

Auroras were reported most frequently in: Minnesota, 11 days; North Dakota, 6.

CANADIAN REPORTS.

Thunderstorms were reported as follows: Yarmouth, 17th, 19th, 20th; Montreal, 17th; Toronto, 27th; Port Stanley, 5th; Saugeen, 6th; Port Arthur, 9th.

Auroras were reported as follows: Father Point, 12th, 15th; Quebec, 3d, 4th, 15th; Toronto, 19th; Port Arthur, 13th, 16th; Winnipeg, 3d, 13th, 15th, 22d, 30th; Minnedosa, 1st, 2d, 6th; Medicine Hat, 30th; Prince Albert, 2d; Edmonton, 3d, 6th.

INLAND NAVIGATION.

The *extreme and average stages of water* in the rivers for the current month are given in Table VIII, from which it appears that the only case in which a river exceeded danger line was that of the James River, at Lynchburg, Va., which had risen 0.2 feet above danger line on the 30th, in consequence of the heavy rains that had fallen the day before in connection with the hurricane in that region. These rains were heaviest in the mountainous parts of western Virginia, Maryland, and central Pennsylvania. In general, the rivers maintained a very uniform stage of water; the greatest ranges during the month were: 9.4 at Chattanooga, and 8.4 at Kansas City and Cairo.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective services.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 75.8°, or 0.7° above normal; the highest was 104°, at Ashville on the 18th, and the lowest, 35°, at Healing Springs and Pineapple on the 30th. The average precipitation was 1.76, or 0.98 below normal; the greatest monthly amount, 3.95, occurred at Rock Mills; no rain fell at Pineapple. The drought which began during the second decade of July, over the central and northern portions of the State, and which was practically unbroken during August, continued with very little exception until the last decade of September, when it was partially broken by scattered, and in some places heavy, showers; but in some portions, notably in Wilcox and adjoining counties, the drought continued throughout the month. The effect of the weather on growing crops was a continuation of that reported for August; all late summer crops were either prematurely forced or entirely checked; in both cases there resulted inferior yields. Cotton was nearly all gathered in by the end of the month, closing a phenomenally early cotton season in this State.

Arizona.—Report not received.

Arkansas.—The mean temperature was 73.3°, or 0.4° above normal; the highest was 106°, at Hot Springs and Prescott on the 17th, and the lowest, 35°, at Corning on the 22d, La Crosse, Keesees Ferry, and Brinkley on the 29th, and Witts Springs on the 27th and 28th. The average precipitation was 3.25, or 0.19 above normal; the greatest monthly amount, 5.07, occurred at Moore, and the least, 0.69, at Gaines Landing.

California.—The mean temperature was 67.9°, or 1.9° below normal; the highest was 118°, at Volcano Springs on the 15th, and the lowest, 18°, at Bodie on the 19th. The average precipitation was 0.37, or 0.16 above normal; the greatest monthly amount, 2.29, occurred at Laporte, while no rain fell at numerous stations.

Colorado.—The mean temperature was 57.4°, or about 1.0° below normal; the highest was 104°, at Lamar on the 1st, and the lowest, 9.0° at Breckenridge on the 28th. The average precipitation was 2.04, or 1.13 above normal; the greatest monthly amount, 5.14, occurred at T. S. Ranch, and the least, 0.15, at Lajara.

Florida.—The mean temperature was 79.5°, or 4.2° above normal; the highest was 100°, at McClenny on the 13th, and the lowest, 48°, at Milton on the 30th. The average precipitation was 4.42, or 0.55 below normal; the greatest monthly amount, 11.12, occurred at Myers, and the least, 0.70, at McClenny. The climatic features of the month were generally abnormal, as indicated by excessive heat and deficiency in precipitation. The drought which began to be seriously felt as early as July still influences the conditions over the greater portion of the State, and its ill effects are evident in the rapidly maturing crops. Cotton opened before maturing, hastened by dry weather and constant sunshine. Though staple crops, such as corn, cotton, and potatoes have been injured, and a reduced production conceded, September has been an ideal month for harvesting. No generally excessive rains prevailed, and all cotton housed was in an excellent condition. A decided departure from these satisfactory conditions took place on the 29th, when a West India hurricane passed over portions of the State. Approaching the coast near Cedar Keys on the morning of the 29th, it pursued a north-northeasterly course through Levy, Lafayette, Alachua, Bradford, Suwannee, Columbia, Baker, and Nassau counties, leaving death and destruction in its wake. The center of the storm passed through portions of the above counties. The effect of the hurricane was felt over the entire northeast portions of the State. At least 50 lives were lost, and damage to the amount of $3,000,000 was the result. Continued dry weather has retarded the growth of plants, and has largely operated to delay sowing over the greater portion of the State. Citrus

trees did very well, and the fruit interests in the southern portion of the State are satisfactory. Over a limited section excessive rains and dry weather alternated, causing some fruit to split.

Georgia.—The average temperature was 76.3°, or 3.0° above the normal; the highest was 107°, at Milton on the 19th, and the lowest, 35°, at Diamond on the 24th. The average precipitation was 2.37, or 1.77 below normal; the greatest monthly amount, 9.59, occurred at Clayton; no rain fell at Monticello.

Idaho.—The mean temperature was 55.5°; or 2.2° above normal; the highest was 101°, at Payette on the 1st, and the lowest, 10°, at Chesterfield on the 27th. The average precipitation was 0.54, or 0.90 below normal; the greatest monthly amount, 1.71, occurred at Warren, and the least, "trace," at Burnside and Downey.

Illinois.—The mean temperature was 62.9°, or 2.8° below normal; the highest was 100°, at Plumhill on the 11th and Mascoutah on the 13th, and the lowest, 27°, at Lanark on the 20th. The average precipitation was 5.46, or 1.41 above normal; the greatest monthly amount, 14.44, occurred at St. Charles, and the least, 1.76, at Muddy Valley.

Indiana.—The mean temperature was 63.7°, or 1.8° below normal; the highest was 100°, at Mount Vernon on the 12th, 13th, and 14th; the lowest was 28°, at Angola, Auburn, and Bluffton on the 23d. The average precipitation was 5.02, or 1.82 above normal; the greatest monthly amount, 8.17, occurred at Indianapolis, and the least, 2.13, at Edwardsville.

Iowa.—The mean temperature was 58.5°, or 3.5° below normal; the highest was 95°, at Bonaparte on the 2d and Malvern on the 8th, and the lowest, 22°, at Mason City on the 27th. The average precipitation was 4.09, or 0.39 above normal; the greatest monthly amount, 9.96, occurred at Mooar, and the least, 1.82, at Iowa City.

Kansas.—The mean temperature was 65.8°, or 2.9° below normal; the highest was 108°, at Medicine Lodge on the 7th, and the lowest, 28°, at Englewood on the 27th. The average precipitation was 2.99, or 0.61 above normal; the greatest monthly amount, 6.44, occurred at Hutchinson, and the least, 0.77, at Meade.

Kentucky.—The mean temperature was 68.6°, or 0.8° below normal; the highest was 100°, at Paducah on the 17th, and the lowest, 30°, at Lola and Pleasant Ridge Park on the 24th. The average precipitation was 3.77, or 0.83 above normal; the greatest monthly amount, 6.17, occurred at Fords Ferry, and the least, 1.79, at Middlesboro.

Louisiana.—The mean temperature was 81.8°, or 0.7° above normal; the highest was 105°, at Oakridge on the 12th, 13th, 17th, and 18th, and the lowest, 36°, at Robeline on the 25th. The average precipitation was 3.30, or 0.35 above normal; the greatest monthly amount, 10.69, occurred at Port Eads, and the least, 0.46, at Abbeville.

Maryland.—The mean temperature was 66.6°, or 0.6° above normal; the highest was 98°, at Taneytown on the 11th, and the lowest, 29°, at Deer Park on the 24th. The average precipitation was 4.33, or 0.73 above normal; the greatest monthly amount, 8.07, occurred at Flintstone, and the least, 1.13, at Milford, Del. The storm of the 29th, though very severe, was not generally as destructive in this State as in those lying to the southward.

Michigan.—The mean temperature was 56.4°, or 3.9° below normal; the highest was 94°, at Waverly on the 4th, and the lowest, 7°, at Newberry on the 9th. The average precipitation was 5.10, or 2.51 above normal; the greatest monthly amount, 8.32, occurred at Kalamazoo, and the least, 1.05, at Baraga.

Minnesota.—The mean temperature was 54.3°; the highest was 97°, at Beardsley on the 7th, and the lowest, 16°, at Lakeside on the 18th. The average precipitation was 2.49; the greatest monthly amount, 4.75, occurred at Worthington, and the least, "trace," at Maplewood.

Mississippi.—The mean temperature was 75.4°, or 1.0° above normal; the highest was 103°, at Yazoo City on the 18th, and the lowest, 33°, at French Camp on the 29th. The average precipitation was 1.45, or 2.36 below normal; the greatest monthly amount, 56.4, occurred at Magnolia, and the least, 0.20, at Natchez.

Missouri.—The mean temperature was 64.9°, or 2.9° below normal; the highest was 101°, at Zeitonia on the 18th, and the lowest, 28°, at Potosi on the 23d. The average precipitation was 4.23, or 0.91 above normal; the greatest monthly amount, 8.17, occurred at Sublett, and the least, 1.65, at Jefferson City. In a number of the northern counties cool, cloudy weather, with frequent showers, considerably retarded the ripening of late corn, but in other sections practically the entire crop was out of danger from frost by the 20th. The frequent rains in the northern counties greatly delayed wheat sowing, but in many of the central and southern counties the work progressed very slowly during the first part of the month owing to drought, but good rains in the latter sections on the 19th, 20th, and 21st put the ground in much better condition, and by the close of the month seeding was generally well advanced and the early-sown wheat was up and growing finely. Fall pastures, at the close of the month, were reported dry and short in a few localities, but as a rule were in good condition.

Montana.—The mean temperature was 52.0°, or 3.0° below normal; the highest was 95°, at Radersburg on the 1st, and the lowest, 13°, at Lewiston on the 9th. The average precipitation was 1.98, or 0.91 above normal; the greatest monthly amount, 6.02, occurred at Kipp, and the least, 0.15, at Poplar.

Nebraska.—The mean temperature was 59.8°, or 3.6° below normal; the highest was 102°, at Norman on the 8th, and the lowest, 16°, at Springview on the 19th. The average precipitation was 2.37, or 0.53 above normal; the greatest monthly amount, 5.90, occurred at Strang, and the least, 0.72, at Dunning.

Nevada.—The mean temperature was 58.3°, or 2.0° below normal; the highest was 102°, at St. Thomas on the 16th, and the lowest, 15°, at Stofield on the 10th and 27th. The average precipitation was 0.35, or 0.01 above normal; the greatest monthly amount, 1.15, occurred at Palmetto; no precipitation fell at Battle Mountain, Mill City, or St. Thomas.

New England.—The mean temperature was 59.0°; the highest was 96°, at Stratford, N. H., on the 12th; the lowest, 24°, at Fort Fairfield, Me., on the 24th and Flagstaff, Me., on the 29th. The average precipitation was 6.16; the greatest monthly amount, 10.32, occurred at Belfast, Me., and the least, 2.06, at Nantucket, Mass.

New Jersey.—The mean temperature was 65.1°, or 0.6° above normal; the highest was 95°, at Belvidere and Somerville on the 11th; the lowest, 30°, at Woodbine on the 24th. The average precipitation was 4.37, or 0.48 above normal; the greatest monthly amount, 8.77, occurred at Charlotteburg, and the least, 2.26, at Atlantic City.

New Mexico.—The mean temperature was about normal; the highest was 99°, at Eddy on the 3d, and the lowest, 20°, at Buckmans on the 27th. The average precipitation was above normal, and was fairly well distributed; the greatest monthly amount, 4.40, at Albert, and the least, 0.72, at Albuquerque.

New York.—The mean temperature was 59.7°, or 1.5° below normal; the highest was 97°, at Waverly on the 11th, and the lowest, 25°, at Canton and Number Four on the 23d. The average precipitation was 4.16, or 0.93 above normal; the greatest monthly amount, 7.42, occurred at Elko Park, and the least, 1.97, at Brookfield.

North Carolina.—The mean temperature was 70.3°, the normal for the month; the highest was 102°, at South Pines on the 18th, and the lowest, 30°, at Linville on the 24th. The average precipitation was 5.31, or 0.77 above normal; the greatest monthly amount, 9.57, occurred at Oakridge, and the least, 1.80, at Selma.

North Dakota.—The mean temperature was 53.0°, or 3.0° below normal; the highest was 98°, at Fort Yates on the 8th, and the lowest, 11°, at Willow City on the 27th. The average precipitation was 1.83, or 0.13 below normal; the greatest monthly amount, 3.59, occurred at Gallatin, and the least, 0.12, at Berthold Agency.

Ohio.—The mean temperature was 62.7°, or 2.0° above normal; the highest was 100°, at Cardington on the 11th, and the lowest, 26°, at Hedges on the 23d. The average precipitation was 5.13, or 2.13 above normal; the greatest monthly amount, 8.11, occurred at Pataskala, and the least, 2.49, at Pomeroy. Very heavy rainfalls were experienced from the 27th to the 30th, and much damage resulted to crops and farm and city property by floods and washouts.

Oklahoma.—The mean temperature was 72.8°; the highest was 107°, at Anadarko on the 7th, and the lowest, 29°, at Beaver on the 28th. The average precipitation was 2.19; the greatest monthly amount, 4.17, occurred at Pond Creek, and the least, 0.97, at Healdton.

Oregon.—The mean temperature was 58.1°, or 0.3° below normal; the temperature was deficient in the western portion, but was in excess in the eastern portion. The average precipitation was 1.02, or 0.96 below normal; the greatest monthly amount, 5.13, occurred at Nehalem.

Pennsylvania.—The mean temperature was 63.6°, or 0.1° below normal; the highest was 98°, at Honesdale on the 11th and Irwin on the 12th, and the lowest, 26°, at Shinglehouse on the 23d. The average precipitation was 4.82, or 1.04 above normal; the greatest monthly amount, 8.57, occurred at Browers Lock, and the least, 1.73, at Cannonsburg. The interior portion of the State was visited by the tropical cyclone of the 29th and 30th. The newspapers estimate the resulting damages at about $2,000,000 dollars. The Pennsylvania Railroad bridge, over a mile in length, across the Susquehanna River at Columbia, was completely demolished and swept from its piers. A conservative estimate of the damage in York County places it at $300,000.

South Carolina.—The mean temperature was 75.0°, or 0.9° above normal; the highest was 105°, at Little Mountain and Shaws Forks on the 18th, and the lowest, 39°, at Allendale and Florence on the 24th. The average precipitation was 2.94, or 2.00 below normal; the greatest monthly amount, 8.06, occurred at Central, and the least, 0.50, at Shaws Forks. On the 29th a severe storm crossed the State from south to north, the path of the storm was from Hampton due north to Lancaster County. It exhibited destructive violence in Beaufort, Hampton, Berkeley, Clarendon, Sumter, Darlington, and Chesterfield counties, with much injury to buildings, open cotton, and forest trees. There were a number of fatalities in Beaufort County. The wind reached velocities estimated at from 75 to 100 miles per hour. The storm had a rapid progressive movement, traveling across the State in not quite four hours, or at the rate of about 53 miles per hour.

South Dakota.—The mean temperature was 57.6°, or 1.5° below normal; the highest was 102°, at Nowlin on the 7th, and the lowest, 15°, at Shiloh on the 19th. The average precipitation was 2.34, or 0.93 above normal; the greatest monthly amount, 5.43, occurred at Howard, and the least, 0.45, at Edgemont.

Tennessee.—The mean temperature was 69.8°, or about normal; the highest was 101°, at Bolivar on the 17th, and the lowest, 34°, at Hohen-

wald and St. Joseph on the 24th. The average precipitation was 3.41, or 0.25 above normal; the greatest monthly amount, 6.50, occurred at Brownsville, and the least, 0.29, at Pope. The lack of sufficient rainfall during the first half of the month was quite seriously felt by late and unmatured crops, and it delayed the preparation of the soil for fall seedings, but otherwise conditions favored the gathering, in good condition, of those crops that were maturing.

Texas.—The mean temperature was 0.9° above normal; there was a general excess, except over the Panhandle and the extreme eastern portion of the coast district, where it ranged from about normal to 4° below, with the greatest deficiency in the vicinity of Amarillo. The excess in temperature ranged from 0.3° to 1.4° over north and west Texas and the central and west coast district, from 1.5° to 2° over central and southwest Texas, and from 2.1° to 3.8° over east Texas, with the greatest excess in the vicinity of Palestine. The maximum was 110°, at Mann on the 5th, and the minimum, 33°, at Mount Blanco on the 28th. The average precipitation was 1.13 above normal. There was a general excess, except along the immediate coast and over the eastern and central portions of north Texas, where there was a deficiency ranging from 0.01 to 4.01, with the greatest in the vicinity of Galveston. The excess ranged from 0.08 to 1.24 over west Texas, the Panhandle, the western portion of north and central Texas, and the eastern portion of east Texas, and from 1.22 to 6.03 over southwest Texas, the eastern portion of central Texas, and the western portion of east Texas; the greatest excess was in the vicinity of Hearne and Golindo. The precipitation was not well distributed during the month, there being almost a total absence during the first and second decades and general excessive rains during the third decade, especially over the central portions of the State.

Utah.—The mean temperature was 61.0°, or about 3.0° below normal; the highest was 100°, at Manti on the 3d and St. George on the 4th, and the lowest, 16°, at Richfield on the 27th. The average precipitation was 1.00, or slightly above normal; the greatest monthly amount, 5.97, occurred at Moab, and the least, 0.12, at St. George.

Virginia.—The mean temperature was 67.9°, or 0.1° above normal; the highest was 99°, at Petersburg on the 18th, and the lowest, 20°, at Guinea on the 24th. The average precipitation was 4.94, or 0.47 above normal; the greatest monthly amount, 8.47, occurred at Woodstock, and the least, 2.67, at Manassas. The predominant feature of the month was the West India hurricane which swept over the State on the night of the 29th. This storm, which had been traveling slowly northward from the Gulf of Mexico for several days prior to its passage across this section, seemed to concentrate its fury in Virginia, and left death and destruction in its wake. The area of greatest violence would probably be comprised within a line run due north from Southampton County, on the east, and one run north by west from Mecklenburg County, on the west, comprising the central two-thirds of the State. In cities buildings were razed and unroofed, trees uprooted and broken, and, in some cases, lives lost, while in agricultural communities farm products, fodder, fencing, outbuildings, orchards, etc., were destroyed. The value of property lost will probably amount to over $1,000,000. Phenomenal rains occurred over Augusta and adjoining counties, causing floods and washouts and loss of life and property.

Washington.—The mean temperature was 56.4°, or 0.8° below normal; the highest was 98°, at Fort Simcoe on the 6th, and the lowest, 18°, at Cascade Tunnel on the 16th. The average precipitation was 1.17, or 0.87 below normal; the greatest monthly amount, 2.80, occurred at Queets, and the least, 0.12, at Fort Simcoe.

West Virginia.—The mean temperature was 65.2°, or about normal; the highest was 95°, at Philippi on the 14th, and the lowest, 22°, at Beckly on the 22d. The average precipitation was 4.59, or 1.50 above normal; the greatest monthly amount, 9.04, occurred at Bloomery, and the least, 1.58, at Beckly. By far the greater part of the month's rain occurred on the 29th and 30th during the passage of the hurricane which swept the country from the Gulf to the northern boundary, and which caused such immense loss of property and several lives. Heavy rains fell in all sections of the State, the fall in the eastern portions being exceedingly heavy. Reports show a very considerable damage to property of various kinds and serious washouts on railroads. The observer at Martinsburg reports a terrible storm on the 29th. Trees were uprooted, houses and fences blown down, the streams rose suddenly and great damage was done to crops along the lowlands. The observer at Old Fields reports that the freshet of the 30th washed away a large amount of corn, hay, and clover seed, and some cattle, horses, and hogs were lost. The eastern and northern counties suffered most severely from this storm, the western portions receiving only heavy rains and moderately strong winds.

Wisconsin.—The mean temperature was 55.9°, or 4.1° above normal; the highest was 90°, at Racine on the 2d, and the lowest, 19°, at Amherst on the 20th. The average precipitation was 4.34, or 1.06 above normal; the greatest monthly amount, 9.58, occurred at Sharon, and the least, 1.27, at Bayfield.

Wyoming.—The mean temperature was 54.1°, or about 4.0° below normal; the highest was 99°, at Wheatland on the 6th, and the lowest, 19°, at Cheyenne on the 27th and Wise on the 26th. The average precipitation was 1.64, or about 0.90 above normal; the greatest monthly amount, 3.35, occurred at Sundance, and the least, 0.40, at Wheatland

SPECIAL CONTRIBUTIONS.

THE WIND-RUSH OF SEPTEMBER 29, 1896.

By Prof. H. A. Hazen (dated October 2, 1896).

On the night of September 29 there occurred the most destructive storm that ever visited Washington, and it merits special study. The weather map at 8 p. m. shows a general storm with lowest pressure, 29.30 inches, at Lynchburg, Va. The lowest pressure at Washington, 29.14 inches, occurred at 10.50 p. m. The wind velocity continued very high from 10.55 to 11.48, and at times reached 70 miles per hour. The destructive wind had a general southerly direction, but came a little from the east on the east side of the city, and from the west on the west side. In Alexandria the wind was nearly southeast.

(*a*) WASHINGTON, D. C.

The most remarkable fact noted was that the destruction was in well marked streaks and not universal. In hundreds of instances a well constructed roof, rafters and all, was blown off, while close by very frail structures at the same height were uninjured. In some cases this effect was undoubtedly heightened by the formation of eddies in the streets, and by the reinforcement of the wind blowing along streets running north and south, but making due allowance for all such cases, there was the clearest evidence that there was not a steady blow over the whole region, but that there were streaks or wind-rushes at various points and along certain well-defined lines. There is also evidence to show that the wind did not bear a definite relation to the baric gradient, for it died down quite rapidly after the maximum period had passed, while the gradient continued for a much longer time.

At the Abert building on Pennsylvania avenue the west wall of the two top stories was blown out, and falling upon a low building it broke through the roof and killed one man. This building had been built very recently, and had not, up to that time, received the glass in either front (south) or back (north) windows, but these were covered with cotton cloth. The singular fact is that the cloth in the back windows was not disturbed. The east and west walls trended about 20° east of north and west of south, and the southeast wind struck them almost at right angles. It seems possible that the blow from the wind was so sudden that the west wall gave way and relieved the pressure before the cloth could be blown out of the back windows. Some have considered that possibly a vacuum on the back of this west wall would have caused a pressure even as high as 2,000 pounds to the square foot. It is known, however, that the utmost vacuum that could have been caused by the wind upon the plane surface would not produce a pressure greater than 8 or 10 pounds per square foot.

On K street, NW., between Thirty-first and Thirty-second streets, two walls were forced out under peculiar conditions. Both walls were on the east side of buildings with a hip roof, the ridge pole running east and west. The windows were all closed so that the pressure on the inside must have been insignificant. Each wall gave way under its roof, which remained intact. There could have been no sudden withdrawal of air pressure from the outside for the reason that the storm was moving north quite slowly, and there was no sudden or marked change in pressure. It seems possible that

these walls were drawn out by the diminished pressure caused by the southwest wind blowing along the roof and side of the house.

The steeple of the New York avenue Presbyterian Church was blown down and appeared almost as if it had been picked up, turned upside down, and dashed down on its point. In the country about Washington there were two streaks of destruction that were well marked. One of them was about 2 miles beyond Cabin John Bridge on the Conduit road, and the other near the Tennallytown pike. A careful search along Seventh street and the Chevy Chase road showed very slight action. On either side of Fourteenth street, however, there was serious destruction to trees and roofs. The official estimate of the total loss to structures throughout the whole city puts it at $400,000.

(*b*) ALEXANDRIA, VA.

It was commonly reported that the worst destruction had occurred at Alexandria, but the facts do not bear out this assertion. There was no tornado track or even the semblance of one. The wind carried the roofs that were blown off a little farther than in Washington, and the unroofing of houses and factories along the river front was quite serious, but aside from this there was little serious destruction.

A church at the corner of Princess and Patrick streets had its roof crushed in, but singularly enough, the tower, which was much taller than the church, was not injured in the least. There was every evidence that the southeast wind struck the east roof of the building (whose ridge pole stretched north and south) and crushed it in because of a great weakness in the timbers supporting the roof.

Every place was visited by me where inquiry showed a visitation of the wind rush. The estimated loss to structures was greatly exaggerated. Four lives were lost. In one case the west brick wall of a 3-story house was drawn out by the wind and crushed through the roof of a lower neighboring house, killing a man in the top story. The streakiness of the wind was far more marked in Alexandria than in Washington, and it was found possible to follow these streaks over much greater distances.

KITE EXPERIMENTS AT THE BLUE HILL METEOROLOGICAL OBSERVATORY.

By S. P. FERGUSSON (dated August 26, 1896).

Kites were first employed at Blue Hill Observatory in observations of atmospheric electricity, by Mr. Alexander McAdie, in the summer of 1885. The kites used were coated with tin foil, and served as collectors; the current passed down a copper wire to the electrometer at the ground. No high flights were attempted. These experiments were repeated by Mr. McAdie in June, 1891, and July, 1892.

In July and August, 1894, Mr. William A. Eddy, of New York, who had been very successful in reaching great altitudes with kites of the so-called "Malay" type, spent two weeks at Blue Hill for the purpose of employing the kites designed by him in meteorological observations. It became very evident after a few days of experimenting that the Eddy kites could be utilized to elevate self-recording instruments, and on August 3 an ordinary Richard thermograph was altered for use in the experiments. The heavy parts were replaced by wood and aluminum, and the modified instrument, with a small basket inverted over it to serve as a screen for the bulb, weighed altogether 2 pounds and 5 ounces. On August 4, 1894, this instrument was twice elevated to a maximum height of 1,430 feet (the height being determined from angles taken at the ends of a 300-foot base line), and an excellent temperature record was obtained. Five Eddy kites, having a total area of about 100 square feet, were employed. This is believed to be the first use of kites for elevating self-recording instruments. The first experiment was repeated with equal success on August 15. A detailed account of the two ascensions, prepared by Mr. Clayton, appeared in the American Meteorological Journal for December, 1894; details of the kites and thermograph were also published in the Scientific American for September 15, 1894.

The experiments were resumed in June, 1895, and since then have been made, under the direction of Mr A. Lawrence Rotch, by Mr. Clayton, Mr. Sweetland, and the writer. Before any ascensions were attempted careful tests of materials for kites and line were made, and a windlass constructed. By the 23d of July a number of serviceable kites were ready and observations were recommenced on that date. Early in August a baro-thermograph, similar to the first instrument, and weighing 2 pounds, was constructed and observations begun with the new instrument. The first Hargrave kite made at the Observatory was flown on August 18, 1895. Mr. Eddy returned on August 17, and remained until September 6, experimenting with kites and making photographs from the kites at elevations of a few hundred feet. Ascensions with the baro-thermograph to an average altitude of about 1,200 feet were also made almost daily during this time. The maximum height reached was 1,916 feet on August 28, with 3,500 feet of line and seven kites. An improved Hargrave kite was first used for lifting the baro-thermograph on September 21, an altitude of 1,600 feet being reached. The baro-thermograph was lost on September 22, 1895, and no further experiments except in improving the kites (both Eddy and Hargrave patterns) were made until November 16. By that time a new instrument, for recording wind velocity and temperature, had been constructed, and was used for the first time on that date; this was probably the first recording anemometer elevated by kites. Ascensions to heights of 1,000 to 1,500 feet were made about twice in each week after that date.

On January 27, 1896, steel music wire was substituted for cord as a main line, and proving to be greatly superior to cord was afterward used exclusively.

During the winter of 1895–96, some records were obtained during rain and snowstorms by using kites, rendered waterproof by varnish. On March 11, 1896, an ascension was made during a severe northeast gale. The recording instrument elevated by two Hargrave kites disappeared in the clouds at a height of 2,000 feet. An altitude of about 3,300 feet was reached, but the instrument was clogged with frostwork and snow, and the record was lost after the clouds were reached. On April 4 a meteorograph, recording pressures by aneroid, as also temperature and humidity, was received from Richard Brothers of Paris, and its use begun. An altitude of 3,964 feet above the hill was attained with this instrument on April 13.

In July, 1896, at the suggestion of Mr. Douglas Archibald, of England, a tail made of cloth cones was attached to one of the Eddy kites, greatly improving its stability.

On July 20 the height of a mile above the hill was reached for the first time, and on August 1, 6,703 feet, the maximum elevation attained so far.

The method followed has been to conduct experiments with the recording instruments in connection with the tests of materials and different forms of kites, as in this way it was found possible to adapt the kites to the work required of them more readily and thoroughly than by perfecting one department of the investigation before beginning the other. Except when the altitude of clouds was measured, the recording instrument was sent up during every ascension with the tandem line, and in this way the most economical use of the kites was made.

During the first eight months the cord used for a main line was what is known as "blocking cord,"—a hard-twisted linen

line resembling the cable-laid twines, the tensile strength of which varied with the different sizes from No. 9, 80 pounds, to No. 32, 300 pounds. Nos. 12, 16, and 32, were used in about equal lengths in the line of 3,700 feet that was in use from June, 1895, to January, 1896. This cord was selected from a great variety of lines tested both for maximum strength with minimum weight and size and for durability, for it was found during the tests that many of the cords that were light in proportion to their strength were not sufficiently durable for continued use. Among cords of this class are flax sole thread (the lightest for its strength of all that were tested) and several varieties of braided lines. The cords were tested in 25-foot lengths, a few tests of this length giving a better average of the strength of the line than many tests of shorter pieces. The durability tests were very important, as very few cords after being once strained to the limit of their strength could withstand the same strain a second time. The loss of strength in the braided lines and shoe-sole thread was considerable, amounting in some cases to 30 per cent, while in the blocking cord and cable-laid twines it rarely exceeded 5 per cent. Frequent tests of the cords in use were found necessary, and to be secure against breaks the average strain upon the line was not allowed to exceed one-third of the breaking strain.

The tests of knots were limited to those that seemed likely to be useful. The "surgeon's" or "fisherman's" knot for uniting lines, the "square knot" for tying joints in kite frames, etc., and the "bowline knot," were obviously so much better for the purposes named than all other knots that no others were tested. Knots were dispensed with whenever possible, as the cords were not durable when tied and retied many times, and in time the surgeon's knot came to be almost the only knot used. As a substitute for knots in attaching secondary kites to the line, a device of Mr. J. B. Millet's was adopted almost at the beginning of the experiments. This device is shown in Figs. 1 and 2. An eyelet is secured to the line by means of two simple loops which are readily loosened after sustaining a continued strain. The secondary or leading line extending to the kite may be attached by the bowline knot, or still better, by a simple toggle made of aluminum. This eyelet and toggle constitutes by far the simplest method of attaching secondary lines to the main line whether the latter be of cord or wire, although in the case of wire great care is necessary to avoid kinking when the eyelet is attached or detached.

During the experiments it very soon became apparent that heights exceeding 2,000 feet would be extremely difficult to reach if cord alone were used for a line. The weight of the cord proved to be of slight consequence compared with the surface exposed to the wind, and the angular elevation of the meteorograph in high winds, as observed from the reel or drum, was, as a rule, less than 35° for heights averaging less than 1,500 feet. Pianoforte, or music wire No. 14 gauge, 0.0326 inch in diameter, tensile strength 300 pounds, and weighing 15 pounds to each mile of length, was finally adopted for the main line. This wire is obtainable in lengths of 7,000 feet or more without splice or break, and, as a main line, has proved far superior to cord. Three and even two kites now attain greater altitudes than did six to ten kites when held by cord, and the average angular altitude of the self recording instrument has increased to nearly 40° even at elevations approximating one mile. The only weak points in the wire are the splices and connections to which the kite lines are secured. The telegraph splice alone, as Professor Marvin points out in MONTHLY WEATHER REVIEW, May, 1896, is objectionable, though when carefully made it answers very well for light strains. The Marvin splice is much better, and probably a combination of the two—a Marvin splice finished at each end with a telegraph coil and this covered with annealed wire—is best of all for durability. In this form of splice, when the end of the wire (after the Marvin splice is complete) is wound tightly around the main wire, the tendency of the twist to straighten and gradually become loose is avoided. The splices should not be less than 6 inches long, and 10 inches is a safe length. A durable splice is better than one which may be strong enough to resist ordinary tests but which weakens through use; and the combination splice referred to is recommended as both strong and durable, it having been thoroughly tested.

For securing the secondary lines to the wire, a form of clamp devised by the writer has been found very satisfactory. As shown in Fig. 3, it consists of an angular aluminum casting with the ends slotted to receive the wire, to which it is clamped by screws. The secondary line is tied in the usual manner in the hole at the junction of the two ends, which is located nearer the short arm of the casting. The clamp is always secured with the short arm toward the kites in order that the strain of the secondary kite may come nearly equally upon the two arms and the danger of permanent bends in the wire avoided. No instance of permanent bending of the wire has occurred during many experiments with this clamp, and from two to six have been used during every ascension for several months; nor has a clamp slipped or become loose when properly made and attached. The only objection that may be made to its use is that some time is necessary to attach it and tighten the two screws. The advantages of such a portable clamp are that it may be applied wherever kites are needed to take up the sagging of the wire, and that all injury to the main wire likely to occur from winding it over permanent connections while under strain is avoided. It has been found that while no injury is caused by winding the wire over loops and splices while the tension is slight, small irregularities in the surface of the drum are sufficient to cause slight permanent bends when the strain is great—from 90 to 150 pounds or more.

The windlass used is similar to the ordinary hoisting windlass and is mounted upon substantial wheels, so that it can be easily moved from place to place. The spool or drum containing the wire is of hard wood. The center of the spool is 6 inches in diameter, and the heads 10 inches in diameter and 1 inch thick. Outside the heads are flanges 10 inches in diameter and one-half inch thick, and these are held in place by three one-half inch bolts passing lengthwise through the drum near its circumference. This spool or drum is operated by two opposite cranks of 8 inches radius. Longer cranks were tried, but the labor of winding in the wire with them was found more exhausting than with short cranks, and the work generally not so satisfactory. A gear of two to one was tried also, but was not so effective as direct cranks.

To the windlass is attached a register for indicating the length of wire used. The wire passes under a hardwood pulley exactly half a meter in circumference, which, with the registering dials, moves freely backward and forward upon its supporting shaft, which is parallel with the axis of the reel, and thus is self-adjusting to any change in position of the wire. Careful tests of this register show it to be very accurate, the greatest differences between letting out and reeling in 3,400 meters of wire not having exceeded 10 meters, and the length of the wire is obtained directly without the necessity of applying any reduction factor.

In computing the altitude of the kite meteorograph the following formula is used:

$$H = l \sin. h,$$

in which H = the height of the instrument above ground, l = the length of the line, and h = angular height of instrument above the horizon. The angular heights are measured by means of a transit located at the windlass, and the length of

the line is determined from readings of the register already described. Repeated comparisons of heights obtained by this method with measures obtained from theodolites at the ends of a base of 1,178 meters, show a mean difference of + 2 per cent and maximum difference of + 5 per cent, this including all errors of triangulation, sagging of the line, and instrumental errors. It is believed that after subtracting 2 per cent to allow for sagging of the line the accuracy of the first method is at least equal to that of the second, and on account of its great simplicity it is to be preferred. One observer can make the readings of the transit and reduce the observations as they are entered.

Much time has been spent in testing materials for kites. For frames, both umbrella ribs and wood have been tried, and of these straight-grained spruce has been found to be the best. For "stringing" the frames and joining the several sticks, several varieties of wire, cord, clamps, and joints have been tested. Picture wire and cord that has been well stretched (old kite line is good) are excellent for stringing the frame, but when an adjustable frame or a detachable cover is desired cord is much better than the picture wire. Metallic clamps and joints, while serviceable in the construction of light kites were not found to be durable and were continually coming loose. The best method of securing the frame of a kite is to tie the parts with well stretched cord and coat the joint with glue. When varnished or painted these joints remain tight. The frames of one or two of the first kites were secured with nails, but these weakened the sticks and in time became loose.

For covering frames, bond tracing paper, fine nainsook, or silk were found to be the strongest and most durable materials for their weight. Lonsdale cambric and percaline are slightly less expensive than nainsook, but are much heavier and no stronger. Manilla paper is cheaper but not so strong as the bond paper and is twice as heavy for the same strength; hence it can not be recommended. Cloth is preferable to paper for kite covers, unless extreme lightness is desired, as, when suitably varnished, cloth-covered kites may be flown in rainstorms and into clouds without injury.

The kites used are of the Eddy or Malay and Hargrave or cellular type, although others have been tested, and these have given excellent results. To some extent the two forms of kites supplement each other, and it has been customary to fly both on the same tandem line. The Eddy kite usually flies in lighter winds than the Hargrave and at a higher angle—with a short line, from 50° to 70°—but it is not so stable as the Hargrave. The Hargrave is very stable and is better adapted to use in high winds, but its angular height is comparatively low—40° to 60°—and its structure more complicated than that of the Eddy. Experiments have been directed, therefore, toward improving the stability and rigidity of the Eddy kite and the angular height attained by the Hargrave. Greater strength and rigidity of frame, without appreciable increase of weight, is obtained by securing together two flat sticks of, say, $\frac{3}{8}$ by $\frac{1}{8}$ inch cross section in the form of a T rail, by coating the surfaces to be joined with glue and tying them together with cord. Varnish or paint renders the joint waterproof. In constructing Eddy kites for use in high winds the dihedral angle has been substituted for the usual bow with better results. A very simple method of constructing this angle joint is shown in Figs. 4 and 5. *B* is a short piece of square tubing, one side of which is slotted to receive the upright stick, *A*. The ends of the pieces forming the cross stick, *D D*, are driven into the open ends of the tubing, which is then bent at the slot to the desired angle, as in Fig. 5. When this is done the jaws of the slot hold the upright stick firmly, and usually no wrapping with cord is necessary to keep the joint tight. A piece of wood, *E*, shaped to fit the angle, is then lashed firmly to the cross sticks, which may be further strengthened by means of a second brace, *F*. An advantage of this construction is that if one stick is damaged, it may be replaced without disturbing the others. All joints are coated with glue and varnish. Several kites made in this way have been in use during a number of ascensions with excellent results, and the joints have remained secure. The cover of the Eddy kite is made up separately and tied to the frame afterward. This method has proved most satisfactory. A diagram of the kite is drawn upon a suitable table or board and a screw placed at each corner of the diagram with its head projecting about $\frac{1}{4}$ inch above the surface. The frame once prepared in this manner will do for any number of kites of the size adopted as the standard. The cloth is stretched over the board and tacked outside the edge of the diagram representing the kite, and the screws forced up through it. The cord to go in the edge of the kite is now passed outside the screws and tied at the screw at the top of the kite, a knot being also made just below each of the side corners, to prevent the ends of the cross stick from slipping down. The cover is pasted over the cord, except at the corners, the paste being rubbed in thoroughly and a smooth seam made. The whole should not be disturbed until thoroughly dry. Drying may be hastened by ironing the seams. The cover, when completed, is tied to the frame; the short sections of the binding cord exposed at the corners are passed over grooves cut in the ends of the sticks. The knots below the side corners are firmly secured against the lower edges of the sticks and the joint coated with glue, to prevent slipping, as these are the places where slipping of the cover and looseness cause distortion of the kite while it is in the air. The cloth of the cover is also firmly lashed over the corners, except at the top of the kite. At this point the ends of the cord, which are left bare for a few inches, are simply tied together with a square bowknot and placed in a groove in the top of the vertical stick. This is to provide for adjustment of the tension of the cover, which, as the kite is used, becomes loose, unless the cloth is well stretched previously, and requires occasional tightening. To make the kite wind proof and waterproof, it should be well varnished. A solution of rubber in bisulphide of carbon and turpentine has been used by Dr. Stanton with excellent results; also the following mixture has been successfully tried at Blue Hill:

Pure rubber (shredded)......1 ounce.
Bisulphide carbon.....2 or 3 pounds.

Add 2 or 3 pounds of this mixture to 1 pound of spar varnish and thin with turpentine. It is best to apply a small quantity at a time, as two or more thin coatings are necessary in most cases. Thick varnish with only a small percentage of rubber appears to rot the cloth or render it brittle, and it is best to use from two to three times as much rubber solution as varnish. But few tests of varnishes have been made, and further experiments are necessary to obtain a varnish fully adapted to coating kites.

Greater stability in the Eddy kite is secured by the use of Archibald's cone tail, which consists of two or more cloth cones placed open end up at intervals of 3 to 6 feet, upon a string attached to the lower end of the kite, the last cone being from 3 to 8 times the length of the kite below it. The cones are usually 5 to 8 inches in diameter and 7 to 15 inches in length, and are kept open at the base by a ring of aluminum wire to which the cloth is sewed or pasted. The ratio of the wind pressure upon the cones to that upon the kites appears to be nearly constant at ordinary velocities, and as the balancing of the kite is dependent upon the pressure of the wind instead of the weight of the tail, the kite will fly steadily through a greater range of velocity than if no tail were used. A serious objection to the tail is its liability to become entangled in the other lines, but this is partially remedied by using longer secondary lines than are necessary for tailless

kites. Except for this defect the combination of the Eddy kite and Archibald cone tail appears to be better adapted to meteorological work than any kite we have tried, as its angular height is greater than that of the Hargrave kite, and its stability very little inferior to it, while the structure is much less complicated. Further experiment, however, is necessary to fully establish this.

The experiments with the Hargrave kite have been conducted almost entirely by Mr. Clayton, who has greatly simplified and lightened the original kite and otherwise improved it. The number of sticks necessary has been reduced to ten and the coverings are laced over the frame, thus rendering the kite adjustable. Rigidity in the frame is secured by using angular pieces of aluminum at the joints, which are bolted or firmly lashed to the sticks. The first kite frame was joined with nails but the sticks split and broke at the points where nails were placed, and this method of fastening the sticks was abandoned. It was found best not to cut or alter the form of sticks, especially when they were subjected to strains in one direction only. The best kites of the new design have flown steadily in all winds, remaining in the air until wrecked without showing a tendency to dive. The range of velocity for these kites is usually between 15 and 35 miles an hour, though the best kites have flown in winds of from 12 to 42 miles.

The recording instruments used are of the Richard type and are constructed as light and rigid as possible. The first two instruments were simple modifications of ordinary thermographs and barographs and need no description. The records were made upon one clock cylinder and the mechanisms were protected from direct sunlight, etc., by a light basket hung over the instrument. A long spring forming part of the suspension cord served to check vibrations caused by the kites. The third instrument or thermo-anemograph, constructed in November, 1895, was encased in an aluminum box instead of a basket and was adapted for observations in rainy and cloudy weather. The thermograph bulb was made at the Observatory and is not so sensitive as the ordinary thermograph, but is sufficiently accurate for good observations. The anemometer is exactly one-half the size of the U. S. Weather Bureau instrument and the cups are suspended below the instrument. The cups and spindle are supported by a ball bearing which reduces friction to a minimum. Each mile of wind is marked upon the record cylinder. The method of suspending the instrument so that its position will be nearly vertical at all times is shown in Fig. 6. The heavy parts are placed near one end and the center of support is also near the heavy end. A fan or sail of sheet aluminum, *A*, extends upward from the rear of the instrument and is equal in area to the end of the instrument below the point of suspension, so that when the instrument is blown backward by high winds its position is still upright and the heavy end still in front. Frequent comparisons of the instrument while suspended near the Observatory, with the standard anemometers, showed differences of only 2 per cent, and no correction for verticality appears to be necessary. The speed of the cylinder that carries the record sheet is $1\frac{3}{4}$ inches per hour and the total weight of the instrument $2\frac{1}{4}$ pounds. The three instruments just described were designed and constructed at the observatory by the writer. The fourth and last instrument was obtained from Richard Brothers, of Paris. It records heights by aneroid, and also records humidity and temperature; its weight is $2\frac{3}{4}$ pounds. The mechanism is protected by a wire cage which does not shelter the thermograph bulb from sunlight, and suitable screens were attached after it was received. All these instruments have been used with success. The principal difficulty met has been that of obtaining good ventilation for the thermograph. Aspiration apparatus is practically impossible and the best shelter appears to be a light wooden basket inverted over the instrument. It is necessary to allow no metal parts exposed to direct sunlight to come in contact with the air that passes the bulb. The screens used with the Richard instrument were devised by Mr. Clayton and are made of varnished cloth; both sides and top are double with an air space between the two walls. This form of screen appears to give good results as shown by comparison with the thermometers in the Hazen shelter and an Assmann aspiration thermometer. Since neither thermometers in the shelter nor aspiration thermometer give true air temperatures at all times the ventilation of the kite thermograph may need to be improved, though in a fresh breeze it appears to be as good as that afforded by the standard shelter of the Weather Bureau. Experiments with screens are being made, however, and a meteorograph is being constructed, in which it is hoped that the defects of the instruments now in use will not appear.

Before the instrument is attached to the kite line it is suspended some distance above the ground for comparison with the standard instruments during a space of from five to twenty minutes. Two kites are secured by lines of 100 to 150 feet in length to the ring or eyelet in the end of the wire, and when these are in the air the instrument is suspended from the same ring by about ten feet of cord. The area of the kites placed at the top of the line depends upon the pressure of the wind, a strain of 20 to 50 pounds upon the wire being sufficient to lift the meteorograph at a good angle. In high winds two kites of not over 15 square feet each are sufficient, and in light winds an area of 20 to 30 square feet for each kite is necessary. From 1,000 to 2,500 feet can then be paid out before a third kite is necessary. The difference in angle between the meteorograph and the wire at the windlass is not usually allowed to exceed 5° before an additional kite is attached. Stops of from three to fifteen minutes are made after each 500 meters of line to obtain records at these points, ascending and descending, and observations, both of the azimuth and angular height of the meteorograph, are made each minute. Intermediate altitudes are determined from the barograph. After the meteorograph is brought back to the ground it is again compared with the standard instruments before the sheets are removed. It is almost impossible to prevent the jerking of the kites from affecting the recording pens, as the pens are disturbed frequently when the kites, to all appearances, are flying with great steadiness; hence frequent comparisons with standard instruments are made to determine corrections. Ascensions have been made in winds averaging from 10 to 40 miles an hour at the ground. The greatest altitudes have been reached in winds of moderate velocity. Since the adoption of music wire for the main line the time and labor of making ascensions has been greatly shortened, and it is now possible to reach altitudes of 1 mile with less fatigue and in less time than was formerly necessary to reach altitudes of 2,000 feet or less. The average height of 22 ascensions made previous to November 30, 1895, was 1,140 feet. This is only about 100 feet lower than the average height of 23 ascensions of the captive balloon employed in the Berlin experiments of 1891–1893. Since January, 1896, the average and extreme heights for the maximum amount of line are as follows:

Length of line.	Mean height.	Maximum height.	Minimum height.
Feet.	*Feet.*	*Feet.*	*Feet.*
2,050	960	1,370	440
6,300	2,220	3,964	375
11,250	4,500	6,703	714

The length of wire used from January to March was 2,050 feet; from March to July, 6,300 feet; and since July 1, 11,250 feet. Hence, if the average heights obtained with cord are to

be compared with those obtained with wire, it is necessary to consider the length of line used. The entire length of the wire or cord was not used in all the ascensions, and the differences between the heights given and the length of wire should not be understood to imply that the angular heights were low. Altitudes approximating 1 mile were reached on July 20, 22, 23, and August 1, 1896, and none of these ascensions occupied over six hours. The ascension of July 20 was managed by three men, although the average strain upon the wire was from 80 to 100 pounds, and the maximum, 125 pounds, or nearly 2 pounds for each square foot of kite surface. On July 23 two ascensions of 2,600 and 5,000 feet, respectively, were accomplished between 1 p. m. and 7 p. m., the usual stops at each 500 meters being included in this time.

In the following tables appear some details of two of our highest ascensions which serve to show the method of conducting the ascensions. Observations are made almost every minute, but it was considered unnecessary to include every observation. Stops were made every 300 or 500 meters, or oftener, from 3 to 5 minutes usually, and kites were attached whenever the angle of the wire at the reel was 5° or more lower than that of the instrument. The dimensions of the kites used are as follows:

Designation of Eddy kite.	Length of sticks.		Total weight of kite.	Approximate area.
	Vertical stick.	Cross stick.		
	Inches.	*Inches.*	*Pounds.*	*Sq. ft.*
4-foot	48	48	0.7	7.5
5-foot	60	60	0.9	11.5
6-foot	72	72	1.6	16.5
7-foot	84	84	2.0	22.0
9-foot	108	108	3.7	35.5

Ascension of July 20, 1896.

Time.	Line out.	Pull on line.	Angle of recording instrument.	Corrected maximum altitude of instrument above hill.	Remarks.
	Meters.	*Pounds.*	°	*Meters.*	
9.15 a. m.	0	......	......	0	Instrument left ground supported by one 6-foot and one 9-foot Eddy kite.
9.25-30 a. m.	300	....	47.0-50.0	233	
9.37-40 a. m.	620	....	48.5	456	6-foot Eddy kite attached.
10.29-38 a. m.	900	....	42.7-48.5	660	Upper kites entered base of strato-cumulus cloud; electricity faint; kites occasionally hidden by clouds.
10.43-47 a. m.	1,200	50-125	41.3-46.2	851	
10.51-54 a. m.	1,500	60-85	35.1-37.5	895	
11.02-04 a. m.	2,000	....	36.6-38.0	1,208	
11.13-14 a. m.	2,500	....	38.4-39.2	1,550	
11.26-29 a. m.	3,000	....	31.1-34.2	1,654	Electricity strong.
11.30-51 a. m.	3,430	....	....	......	Kites hidden by clouds.
0.14-19 p. m.	3,030	110	37.7-36.4	1,817	
1.08-10 p. m.	2,000	125	35.3-33.8	1,134	
1.42-50 p. m.	1,400	110	32.7-34.2	760	Kites below clouds.
2.20-23 p. m.	900	....	31.8-34.9	504	
2.34-38 p. m.	610	95	30.0-31.3	311	
2.49-51 p. m.	300	....	34.9-37.2	177	
3.03 p. m.	0	....	....	0	On ground.

Ascension of August 1, 1896.

Time.	Line out.	Pull on line.	Angle of recording instrument.	Corrected maximum altitude of instrument above hill.	Remarks.
2.19 p. m.	0	....	....	0	Left ground; instrument supported by two Eddy kites, one 6-foot and one 9-foot.
2.34-39 p. m.	500	....	25.0-47.0	358	9-foot Eddy kite attached.
2.50-51 p. m.	1,000	100	28.0-30.5	497	
3.02-07 p. m.	1,500	....	45.2-51.5	1,152	Electricity faint; 6-foot Eddy kite attached.
3.20-23 p. m.	2,000	130	30.0-33.3	1,076	
3.50-59 p. m.	2,500	....	33.5-36.5	1,459	6-foot Eddy kite attached.
4.08-18 p. m.	3,000	....	31.0-34.9	1,682	4-foot Eddy kite attached.
4.22-52 p. m.	3,420	100	30.0-37.5	2,043	
5.18-20 p. m.	2,500	....	35.0-35.5	1,425	
5.51-53 p. m.	1,500	....	43.0-44.5	1,030	
6.07-09 p. m.	1,000	....	42.5-44.6	688	
6.26-28 p. m.	500	....	43.9-43.3	340	
6.39 p. m.	0	....	....	0	On ground.

Remarks.—On July 20, the weather was cloudy, the wind from the south and southwest, the mean velocity increasing from 19 miles an hour at 9 a. m., to 33 miles an hour at 3 p. m. Rain began at 3.50 p. m. Maximum temperature of day 74°, minimum 59°.

On August 1, the weather was clear, wind variable before 1 p. m. and very light; the mean velocity at 2 p. m. was 16 miles, and at 6 p. m. 20 miles, varying between 11 and 26 miles an hour during the ascension. The direction from 2 p. m. to 6 p. m. was west and southwest. Maximum temperature 73°, minimum 52°.

The instrumental records of humidity, temperature, and wind velocity are very valuable and interesting. The records at different levels give approximate sections of the upper air, and the changes occurring at different levels can be determined very easily. The directions assumed by the different kites of the tandem also indicate the direction of the wind prevailing at the level of these kites, which in many instances is different from that at the earth's surface. The differences on days when the sea breeze prevails are specially marked, and on one occasion two kites less than 200 feet apart were flying in opposite directions, the lower being sustained by the easterly sea breeze, while the upper was supported by the westerly wind prevailing above the sea breeze. The height and the thickness of the low stratus clouds are easily measured by the tandem line, especially in many instances where the clouds are too uniform to be observed with theodolites. On July 20 the humidity rose from 70 to 100 per cent when the instrument entered the strato-cumulus cloud at 2,070 feet, and afterward at a height of 5,000 feet it fell to 68 per cent or lower, as the dryness was so great that the ink evaporated from the recording pens, showing that the air became very dry above the moist current of air supporting the cloud. The vertical decrease of temperature with elevation is found to be greatest immediately preceding and during cold waves and least before and during warm waves. At elevations between 1,000 and 2,000 feet the wind velocity is about 25 per cent higher than at the summit of Blue Hill.

The results, in detail, of the kite experiments, are being prepared for publication in the Annals of Harvard College Observatory, and the present sketch is intended only to show, to a limited extent, the possibilities of this method of exploring the upper air. It will be seen that the altitudes already reached have been limited in every case by the amount of line employed. With additional length of line and improved apparatus already arranged for and in process of construction, it is safe to predict that altitudes at least twice as great as those already attained will be accomplished.

A HIGH KITE ASCENSION AT BLUE HILL.

By Prof. S. P. FERGUSSON (dated October 9, 1896).

On October 8 the Blue Hill meteorograph was sent up to a height of 9,375 feet above sea level, or 8,740 feet above the summit of Blue Hill, and remained higher than a mile above the hill for three hours. Nine kites, with a total area of about 170 square feet, were used to lift the instrument and the 3 miles of wire; the ascent was completed in about twelve hours, although between 11 a. m. and 1 p. m. the line was drawn down to a height of about 600 feet to remove a defective kite. The ascent from this point was completed in less than ten hours. The record is one of the best we have obtained so far. (The original record is reproduced in fac simile on Chart No. VI.) The altitude scale is much too wide and the correction to the barograph readings at altitudes above 1,600 meters is considerable. The height above given was obtained from angular altitudes observed with a surveyor's transit at the windlass, and has been checked by readings of the barograph. The corrections to the barograph were determined by placing the instrument under an air-pump and

noting the fall of pressure necessary to raise the pen to the highest point recorded. The time at which the instrument entered the cloud, at 1.58 p. m., is shown by the rise in humidity at that hour, and the time the instrument passed above the clouds is shown by the rapid fall of the humidity between 3 and 4 p. m. As the kites were drawn down, the cloud was again entered, at about 5.30 p. m.; the instrument was left at this height until 8 p. m. The time at which the weather cleared is shown by a decided fall in humidity at 7 p. m. The temperature at the highest point was about 20.2° F., or about 26° lower than the temperature at the observatory. The average strain on the line for several hours, when at the highest elevation, was between 60 and 100 pounds, but after 6 p. m. it became less, and for the entire ascent was between 30 and 55 pounds. A hand windlass was used for winding in the line. Three men—Messrs. Clayton, Sweetland, and myself—did the whole of the work without assistance.

PHENOLOGY.

A general summary of the literature of phenology showing somewhat fully the results already obtained by the study of a great mass of observations was submitted by the Editor in a report of June 30, 1891, but this seems to have formed a volume too bulky for publication. Subsequently a report was made by Prof. L. H. Bailey, of the College of Agriculture in Cornell University, on the general subject of phenology. As the publication of the latter report has been delayed it is thought best to present, through the medium of the MONTHLY WEATHER REVIEW, the following portion which suggests useful work for voluntary observers. It is hoped that the present brief instructions will suffice to stimulate the interest in this subject which would seem to have flagged somewhat in America during the past twenty-five years. As the conservative botanists still retain the use of the Latin language and the reckoning of longitudes from Ferro, 18° 07′ west of Greenwich, the Editor has not ventured to alter these matters.—C. A.

INSTRUCTIONS FOR TAKING PHENOLOGICAL OBSERVATIONS.

By Prof. L. H. BAILEY.

Phenological observations are of two general types, although there is no invariable difference between them; those which record simply the external features of the passing life of plants and animals, and those which attempt to discover or construct some vital connection between life events and climatal environment. The one is concerned chiefly with mere observations, the other with experiment and the philosophy of life courses. While the recording of life-dates may serve either purpose, it must be left to the trained scientist to make the comparisons in the deeper studies of the mutual relationships of climate and periodical phenomena. At the present time I wish simply to indicate the practical methods to be pursued in the taking of notes that shall have permanent value.

Of first importance is the purpose which the observer has in mind. This purpose should be restricted to a definite line of inquiry, and its theme, if it be phenological, should be climate rather than natural history. Let him take one or more of the following subjects:

1. To determine the general oncoming of spring.
2. To determine the fitful or variable features of spring.
3. To determine the epoch of the full activity of the advancing season.
4. To determine the active physiological epoch of the year.
5. To determine the maturation of the season.
6. To determine the oncoming of the decline of fall.
7. To determine the approach of winter.
8. To determine the features of the winter epoch.
9. To determine the fleeting or fugitive epochs of the year.

It is evident that any miscellaneous series of observations will satisfy none of these purposes, unless, possibly, the last. Such plants must be selected as will give unequivocal periods, and which are convenient for observation year by year. The observer must feel that records are valuable in proportion to the number of years over which they extend. Except in determining fugitive epochs (No. 9), observations of a single season alone have little value. Hoffmann's five tests of phenological observations are as follows:[1]

1. As broad a distribution as possible of the given species selected for observation.
2. Ease and certainty of identifying the definite phases which are to be observed.
3. The utility of the observations as regards biological questions, such as the vegetative periods, time of ripening, etc.
4. Representation of the entire period of vegetation.
5. Consideration of those species which are found in almost all published observations, and especially of those whose development is not influenced by momentary or accidental circumstances, as is the dandelion.

Generally speaking, the events which determine the epochs 1, 3, 4, 5, and 6 should be observed upon a definite and well chosen set of plants of limited number, and it is important that the dates should generally represent the average epoch, and not the very first bloom or leaf upon some individual early plant. In recording the leafing of plants, the date chosen should be that upon which the leaves are seen to be spread open or expanded so that the upper surface is visible, and not the mere bursting or unrolling of the bud. Hoffman's "Scheme for phenological observations" is essentially that proposed by Linnæus:

a. Upper surface of the leaf first visible or spread open.
b. First blossom open.
c. First fruit ripe.
d. All leaves, or more than half of them, colored.

One should also be careful to select a typical or average plant for observation, and one which is not unduly exposed either to heat or cold, moisture or dryness. The observer should be careful to state if the plant is in wild or cultivated grounds. Most authorities discourage the taking of dates from the same individual plant year after year, although this is one of the most accurate means of determining variations in local climate; but it may not represent the average of a wide range. The safest plan is to take notes upon two or three typical individuals and then to average the observations. The leafing period of some diœcious plants differs between the two sexes. Britton has found,[2] for instance, that "the female in diœcious plants appears to hold its foliage longer than the male." This was "very strongly marked in *Ailanthus glandulosus*, *Acer saccharinum* and *Acer rubrum*,[3] and *Salix alba* and *Salix discolor*, but not in *Populus*." Woods[4] observed, however, that in the cottonwood "the female tree generally drops its leaves first and leafs out last." The observer should also consider that his observations of blooming and leafing correct or check each other, and that, therefore, both epochs should be recorded in the same specimens, so far as possible. Observations should be made every day.

In publishing phenological observations which are taken at a single station, the species of plants should be arranged according to the dates of the events, beginning with the earliest, and not alphabetically. That is, it is generally best to devote the first column to dates, the second to names of the plants, and the third to the events.

The proper method of securing phenological records is to put the matter in the hands of a single person or office for

[1] Hermann Hoffmann, Phanologische Beobachtungên aus den Jahren, 1879-1882, p. 141.
[2] Bull. Torr. Bot. Club, vi. 211.
[3] The maples are not strictly diœcious, but polygamo-diœcious.
[4] A. F. Woods, Bull. 11, Nebr. Exp. Sta.

each State, or geographical region, or better still, for the entire United States. The best results can be secured under direction from a central office, connected with the Weather Bureau, at Washington. This office should determine the species of plants to be observed in every geographical region, and should distribute printed blanks upon which the observations are to be recorded. The records would then be uniform and comparable, and results of inestimable value would soon be obtained. There is really no possibility of arriving at conclusions of permanent value from any study of the scattered and disconnected observations thus far made in this country.

The methods of the German phenologists illustrate the great value which they attach to uniformity of observation. Hoffmann and Ihne recommend observers to select their plants from the following list, and to make the returns upon this model:

Feb. 10. *Corylus Avellana*, Stäuben der Antheren (shedding of the pollen).
Apr. 10. *Aesculus Hippocastanum*, B. O.
13. *Ribes rubrum*, e. B.
17. *Ribes aurem*, e. B.
17. *Betula alba*, e. B., Stäuben der Antheren (shedding of the pollen).
18. *Prunus Avium*, e. B.
19. *Prunus spinosa*, e. B.
19. *Betula alba*, B. O. s.
22. *Prunus Cerasus*, e. B.
23. *Prunus Padus*, e. B.
23. *Pyrus communis*, e. B.
25. *Fagus sylvatica*, B. O. s.
28. *Pyrus Malus*, e. B.
May 1. *Quercus pedunculata*, B. O. s.
3. *Lonicera Tatarica*, e. B.
4. *Syringa vulgaris*, e. B.
4. *Fagus sylvatica*, Buchwald grün, allgemeine Belaubung (beech woods green, generally in leaf).
4. *Narcissus poeticus*, e. B.
7. *Aesculus Hippocastanum*, e. B.
9. *Crataegus Oxyacantha*, e. B.
12. *Spartium scoparium*, e. B.
14. *Quercus pedunculata*, Eichwald grün, allgemeine Belaubung (oak woods green, generally in leaf).
14. *Cytisus Laburnum*, e. B.
16. *Cydonia vulgaris*, e. B.
16. *Sorbus Aucuparia*, e. B.
28. *Sambucus nigra*, e. B.
28. *Secale cereale hibernum*, e. B. (Winter rye.)
28. *Atropa Belladonna*, e. B.
June 1. *Symphoricarpos racemosa*, e. B.
2. *Rubus Idaeus*, e. B.
2. *Salvia officinalis*, e. B.
5. *Cornus sanguinea*, e. B.
14. *Vitis vinifera*, e. B.
20. *Ribes rubrum*, e. Fr.
21. *Ligustrum vulgare*, e. B.
22. *Tilia grandifolia*, e. B.
26. *Lonicera Tataricum*, e. Fr.
30. *Lilium candidum*, e. B.
July 4. *Rubus Idaeus*, e. Fr.
5. *Ribes aureum*, e. Fr.
19. *Secale cereale hibernum*, Ernte-anfang (beginning of harvest).
30. *Sorbus Aucuparia*, e. Fr.
30. *Symphoricarpos racemosa*, e. Fr.
Aug. 1. *Atropa Belladonna*, e. Fr.
11. *Sambucus nigra*, e. Fr.
24. *Cornus sanguinea*, e. Fr.
Sept. 9. *Ligustrum vulgare*, e. Fr.
16. *Aesculus Hippocastanum*, e. Fr.
Oct. 10. *Aesculus Hippocastanum*, a. L. V.
13. *Betula alba*, a. L. V.
15. *Fague sylvatica*, a. L. V.
20. *Quercus pedunculata*, a. L. V.

The abbreviations following the names represent the life events, and are as follows: B. O. or B. O. s., surfaces of leaves first visible (erste Blattoberflachen sichtbar); e. B., or b., first flower opens (erste Bluthen offen); e. Fr., or f., first fruit ripe in the case of soft fruits, or definitely colored in the case of seeds in capsules (erste Frucht reif, definitiv verfarbt); a. L. V. or L. V., leaves all, or more than half of them, colored (allgemeine Laubverfärbung, über die Hälfte der Blätter verfärbt).

In publishing the records of the various observers, Hoffmann[1] first inserts the records for Giessen, his own station, as a basis of comparison. The method of this publication will interest the reader, and I insert an example. The abbreviations which I have just given are used in these records. The Roman numerals refer to the months. At the close of each record, the average blooming season is compared with that of Giessen, by computing it in the following manner with the April epoch of that place:

Reduction to the April blooming at Giessen.

	Average April blooming.		Days after Giessen.
	Giessen.	St. Paul.	
Betula alba b	17 IV	18 IV	—1
Prunus avium b	18 IV	19 IV	—1
Prunus Cerasus b	22 IV	26 IV	—4
Prunus Padus b	23 IV	28 IV	—5
Prunus spinosa b	19 IV	19 IV	0
Pyrus communis b	23 IV	27 IV	—4
Pyrus Malus b	28 IV	2 V	—4
Ribes aureum b	17 IV	....	....
Ribes rubrum b	13 IV	17 IV	—4
Average	20 IV	....	—3

	Average, 1882.		Days after Giessen.
	Giessen.	Berleburg.	
Betula alba b	....	....	....
Prunus avium b	3 IV	20 IV	—17
Prunus Cerasus b	9 IV	27 IV	—18
Prunus Padus b	10 IV	28 IV	—18
Prunus spinosa b	31 III	25 IV	—25
Pyrus communis b	9 IV	24 IV	—15
Pyrus Malus b	21 IV	15 IV	—24
Ribes aureum b	....	....	....
Ribes rubrum b	31 III	19 IV	—19
Average	....	....	—19

The tabulation of the records proceeds as follows (the additional abbreviations are, J. in the parenthesis stands for years; (19 J.) means 19 years of observation; W. means Wald allgemeine Belaubung, *i. e.* forests generally in leaf; Apr. Red. means April reduction, as deduced from the comparison of all the springtime observations with those at Giessen):

Example of a summary of a long record.

GIESSEN.—N. 50° 35′, E., from Ferro, 26° 20′; 160 meters above sea; mean temperature 6.7° R. (8.4° C.); observer, H. Hoffmann.

Average, 1845–1883.——*Aesculus Hippocastanum* B. O. 10 IV (19 J.); b. 7 V (29 J.); f. 16 IX (29 J.); L. V. 10 X (25 J.).——*Atropa Belladonna* b. 28 V (24 J.); f. 1 VIII (17 J.).——*Betula alba* b. 17 IV (15 J.); B. O. 19 IV (5 J.); L. V. 13 X (10 J.).——*Cornus sanguinea* b. 5 VI (9 J.); f. 24 VIII (2 J.).——*Corylus Avellana* b. 10 II (35 J.).——*Crata-*

[1] The student should also consult the method pursued in Quarterly Journal of the Royal Meteorological Society. Consult Preston's lists in volume for 1884, and previous.

gus Oxyacantha b. 9 V (27 J.).——*Cydonia vulgaris* b. 16 V (16 J.).——*Cytisus Laburnum* b. 14 V. (21 J.).——*Fagus sylvatica* B. O. 25 IV (18 J.); W. 4 V (35 J.); L. V. 15 X (27 J.).——*Ligustrum vulgare* b. 21 VI (10 J.); f. 9 IX (3 J.).——*Lilium candidum* b. 30 VI (26 J.).——*Lonicera Tatarica* b. 3 V (11 J.); f. 26 VI (4 J.).——*Narcissus poeticus* b. 4 V (30 J.).——*Prunus Avium* b. 18 IV (30 J.); *Cerasus* b. 22 IV (27 J.).——*Padus* 23 IV (25 J.).——*Prunus spinosa* b. 19 IV (26 J.).——*Pyrus communis* b. 23 IV (30 J.).——*Malus* b. 28 IV (30 J.).——*Quercus pedunculata* B. O. 1 V (17 J.); W. 14 V (21 J.); L. V. 20 X (16 J.).——*Ribes aureum* b. 17 IV (11 J.); f. 5 VII (4 J.).——*Ribes rubrum* b 13 IV (25 J.); f. 20 VI (31 J.).——*Rubus Idæus* b. 2 VI (3 J.); f. 4 VII (6 J.).——*Salvia officinalis* b. 2 VI (3 J.).——*Sambucus nigra* b. 28 V (30 J.); f. 11 VIII (30 J.).——*Secale cereale hybernum* b 28 V (30 J.); f. becoming mealy 10 VII (8 J.); harvest begins 19 VII (29 J.).——*Sorbus Aucuparia* b 16 V (18 J.); f. 30 VII (18 J.).——*Spartium scoparium* b. 12 V (14 J.).——*Symphoricarpos racemosa* b. 1 VI (3 J.); f. 30 VII (4 J.).——*Syringa vulgaris* b. 4 V (29 J.).——*Tilia Europæa (a) grandifolia* b 22 VI (21 J.); *(b) parvifolia* b. 27 VI (17 J.).——*Vitus vinifera* b. 14 VI (31 J.).

Example of a record for one year.

APELDOORN, HOLLAND.—Lat. 52° 13′, Long. 23° 36′; altitude .... Kok Ankersmit, H. O., 1882.——Aesc. b. 28 IV; f. 30 VIII.——Atro. b. 31 V.——Crat. 4 V.——Cyd. 2 V.——Cyt. 5 V.——Lil. 1 VII.——Lon. b. 24 IV; f. 28 VI.——Narc. 29 IV.——Prun av. 5 IV——Cer. 7 IV.——Pad. 14 IV; spin. 8 IV.——Pyr. co. 10 IV; Mal. 21 IV.——Rib. ru. b. 31 III; f. 22 VI.——Samb. b. 27 V; f. 30 VIII.——Sec. b. 27 V.——Sorb. b. 3 V; f. 5 VIII.——Spart. 26 IV.——Syr. 5 V.——Til. gr. 24 VI.——Vit. 10 VI.——Apr. Red. two days after Giessen.

It will be seen that these records of Hoffmann aim to determine the date epochs of the advancing season. Linsser, who takes a more philosophical view of the problem, and considers it in relation to ultimate climatological effects, tabulates the average results of many observations in connection with the temperature or physiological constants. I give an example. The various columns in the record are as follows: 1, station; 2, total annual accumulated temperature, divided, for convenience, by 1,000; 3, mean day of leafing; 4, number of observations; 5, accumulated temperature for the event; 6, fractional or proportional part of the annual total; *e. g.*, $\frac{453}{4300} = 0.11$. The other divisions for blooming and ripening of fruit, respectively, follow the same order, omitting, of course, the station and the annual total accumulated temperature.

Prunus Padua, 27 Stations with 490 Observations.

(From Linsser's second paper, page 23.)

Stations.		Leafing.				Blooming.				Ripening.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14
				°				°				°	
Dijon	4.3	9 Apr.	8	453	0.11	30 Apr.	8	708	0.17	14 July.	7	2,053	0.48
Heidelberg	3.9	....	...	....	.....	6 May.	6	696	0.18	....	...	......	....
Paris	3.9	....	...	....	.....	27 Apr.	1	626	0.16	....	...	......	....
Namur	3.9	2 Apr.	13	345	0.09	28 Apr.	15	594	0.15	....	...	......	....
Ghent	3.8	4 Apr.	6	335	0.09	28 Apr.	6	566	0.15	6 Aug.	1	2,250	0.59
Ostende	3.7	15 Apr.	13	464	0.12	1 May.	12	628	0.17	8 Aug.	11	2,072	0.55
Brüssel	3.7	16 Apr.	13	408	0.11	11 May.	17	681	0.18	....	...	......	....
Braunschweig	3.4	....	...	....	.....	2 May.	30	544	0.16	....	...	......	....
Stavelot	3.2	....	...	....	.....	6 May.	9	423	0.13	....	...	......	....
München	3.1	27 Apr.	9	305	0.10	4 May.	8	375	0.12	12 Aug.	8	2,026	0.65
Tübingen	3.1	16 Apr.	1	274	0.09	3 May.	10	444	0.14	....	...	......	....
Stettin	3.1	14 Apr.	7	183	0.06	5 May.	20	375	0.12	13 July.	20	1,423	0.46
Kreuzburg	3.0	....	...	....	.....	5 May.	4	323	0.11	....	...	......	....
Görlitz	3.0	28 Apr.	2	280	0.09	7 May.	11	366	0.12	....	...	......	....
Orel	2.8	3 May.	3	144	0.05	16 May.	3	276	0.10	17 July.	1	1,324	0.47
Moskau	2.6	11 May.	3	184	0.07	23 May.	6	319	0.12	18 Aug.	3	1,880	0.71
Riga	2.6	12 May.	4	216	0.08	22 May.	6	321	0.12	14 July.	2	1,154	0.45
Christiania	2.4	11 May.	11	191	0.08	27 May.	10	359	0.15	....	...	......	....
Abo	2.3	23 May.	2	260	0.11	2 June	19	374	0.16	4 Aug.	3	1,372	0.60
St. Petersburg	2.3	9 May.	6	111	0.05	2 June	14	348	0.15	12 Aug.	6	1,475	0.65
Carlo	1.9	28 May.	13	179	0.09	16 June	13	386	0.20	....	...	......	....

The value of the accumulated temperatures is only relative or comparative, not absolute. It does not matter so much how they are obtained, as that they shall all be secured from uniform data. They are generally made by adding up the customary three daily readings of the thermometer. The total accumulated temperature, then, may be the sum of 1,095 (365 × 3) readings of the thermometer, or any other number of readings which any central authority may determine upon. The accumulated temperature of any life event may, for convenience, be reckoned as that part of the annual accumulated temperature which accumulates between January 1 and the date of the event.

Nothing now remains, I think, for the instruction of the observer, but to give a list of the plants which he shall observe. Unfortunately, this is no easy task for a country so large as the United States. As a general statement, it may be said that the observer should select a dozen species which are the most abundant, the most generally distributed over a wide area, and which have the most marked flowers and emphatic periods of bloom and other epochs. The staple cultivated fruits answer these purposes well, as apples, pears, plums, cherries, quinces, raspberries, blackberries, strawberries; and for the sudden moods of early spring, the peach is excellent. Forest trees usually have such inconspicuous bloom that no one but a botanist is likely to take the observation at exactly the proper time. This is particularly true of those which bear catkins, for these organs are not only inconspicuous, but they often increase in length for several or many days, and the period is therefore indefinite. Trees and shrubs are usually better than herbs for general records, as they commonly have more definite seasons and they are less modified by incidental circumstances. Many plants that are well adapted to the purposes of phenological records must be omitted because the general observer is unable to accurately determine the particular species to which they belong. This is notably the case with our thorn trees, or *Cratægus*, the species of which are difficult of analysis, even to the botanist.

For the fugitive or abnormal epochs of the year, as "warm spells" in winter or spring, or "late falls," and the killing frosts of fall and late spring, the observer must consider whatever species come in his way. And here is the chief value of the dandelion in phenological records—it should not be included in any general scheme of notes. There is the greatest temptation to record the blooming of the very earliest spring flowers, as mayflower or epigea, hepatica, erigenia, dandelion, willows, crocus, and the like. This is well, and the records should be made, as showing the first burst of spring; but these records should not be mixed in with those designed to show the general onward course of the seasons.

It is impossible to specify the plants which are best adapted to phenological notes over so wide and various a territory as ours. Much will depend, also, upon the training of the observers. If the records could be made by botanists, many species could be included which other observers could not be trusted to distinguish from closely related species. Observers who are doubtful as to the proper name of a plant from which records are taken should send a botanical specimen of it to a competent person; and whenever any central office or collator notices aberrant dates in suspected species he should call for botanical specimens. Nearly all phenological records in this country have been made by botanists, and they are printed in the botanical or natural history publications. This means that the subject has been considered to be a biological one rather than a climatological one. I hope that this attitude may now be shifted, so as to place phenological records with the science of climate rather than with the science of organisms. The periods of animals and plants are often of great value in determining specific characters, but this use of them has only a remote connection with the proper science of phenology. I shall not attempt, therefore, to give a list of suitable plants for the whole country, but will mention those which appear to me to be most valuable for the main phenological observations and for the general run of observers in New York and New England, it being understood that the observer shall designate, as far as possible, the particular variety which he has recorded in the case of cultivated plants:[1]

[1] The student may be interested in consulting the list of plants in Magnuss' Tabellarische Zusammenstellung Phanologischer Beobachtungen, 1893.

Apple.
Pear.
Quince.
Plum.
Sweet cherry.
Sour cherry.
Peach.
Choke cherry (*Prunus Virginiana*).
Wild black cherry (*Prunus serotina*).
Japanese or flowering quince (*Pyrus Japonica*).
Cultivated raspberry.
Cultivated blackberry.
Cultivated strawberry.
Lilac.
Mock orange syringa (*Philadelphus coronarius*).
Horse chestnut.
Red-pith elder (*Sambucus racemosa*).
Common elder (*Sambucus canadensis*).
Flowering dogwood (*Cornus florida*).
Native basswood.
Native chestnut.
Privet or prim (*Ligustrum vulgare*).
Red currant.
Cultivated grape.

In making the records, the events to be noted are those specified by Hoffmann, taken from normal or average plants—surface of leaf first visible; first flower open; first fruit ripe or full colored; half or more of the leaves full colored. To these should probably be added the date of nearly complete defoliation for those species whose leaves color some time before they fall. All aberrant or unusual flowering seasons should be recorded, but they should be distinctly marked in order that they may not be confounded with the normal events. All sudden meteorological changes which noticeably affect the plants under observation should be noted, as frosts in fall and spring, and high winds when defoliation is taking place. In short, the observer should endeavor to make his notes in such manner that they shall record the entire movement of the seasons.

Persons who spend their summers in resorts at the seacoast, in the mountains, or elsewhere, can make useful records, provided they visit the same places year by year. They can select a few typical plants, and observe their condititions at time of arrival and departure. At the same time, they can often make records of the progress of harvests of hay and grain, and other staple crops.

PROGRESSIVE MOVEMENT OF THUNDERSTORMS.

By A. J. HENRY (dated October 28, 1896).

In a letter of September 24, Mr. J. E. Lanouette, observer, Weather Bureau, in charge of station at Tampa, Fla., says:

I have the honor to ask for some information in regard to the prevailing direction of thunderstorms at other stations on the Gulf Coast. Thus far this summer the prevailing direction at this station has been from the southeast to northwest.

During the four years and more that I was on duty at Titusville the thunderstorms invariably developed either in the southwest, west, or northwest.

I remember but one instance where the storm developed in a quadrant different from those mentioned, and that was on the coast to the northeast of Titusville.

At other stations where I have been on duty, a thunderstorm moving from the southeast to northwest would be an abnormal direction, but here it seems to be normal.

This subject has at different times been discussed in this office, and while the general opinion favors this direction as due to the greater amount of vapor present in the Gulf, it would be interesting to get the views of the Bureau on this point, for if this theory is correct it would explain the eastern movement on the east coast toward the Atlantic, and the directions at Corpus Christi and Galveston should be toward the Gulf.

Key West, being uninfluenced by the same conditions which are present on the main land, should show a direction different from any of those mentioned.

In this connection I would say that the cloud movement here is very sluggish, more so than at any station where I have served.

The following reply to the above has been made and will, it is hoped, stimulate further study of this subject by others.

The questions propounded by Observer Lanouette are of no little interest since they invite a study of thunderstorms in the region of greatest frequency in the United States, where also the conditions of formation are somewhat different from those which obtain in more northern latitudes.

Tampa lies near the dividing line between the general westerly and easterly motions of the air strata in which thunderstorms originate and at a considerable distance south of the center of cyclonic systems passing eastward. In fact it would seem there is no simple relation between the position of a cyclonic system farther north or northwestward and the occurrence of thunderstorms in the Gulf States and Florida Peninsula. Moreover, the fact that the maximum frequency of thunderstorms occurs during July and August when the general easterly movement of the atmosphere is more or less feeble and the tendency to the formation of cyclones less pronounced, seems to warrant the belief that cyclonic influence has little share in the development of thunderstorms in this region. It is also believed that the thunderstorms experienced in the Florida Peninsula are less violent than those of the Mississippi and Ohio valleys. Additional information upon this point, however, is desired.

The data of the subjoined table show the direction of movement of thunderstorms at selected stations on the Gulf and South Atlantic coasts. For the sake of comparison the values for each of the eight principal points of the compass have been expressed as a percentage of the whole number of storms observed.

It is obvious that the general direction at the majority of the points selected is from some westerly quarter, the notable exception being Key West. The direction of motion at the latter station, as might be expected from its geographic position, is wholly different from that of the remaining stations, with the possible exception of Tampa. Key West lies well within the influence of the northeast trades at all times, and it is not surprising that the prevailing direction of thunderstorms should be toward a westerly quarter.

Tampa and Jupiter, the nearest stations to Key West, lie near the line of division between the prevailing easterly winds of the middle latitudes and the westerly winds of the Tropics, but on opposite sides of the peninsula. The direction of motion at Tampa is somewhat similar to that at Key West, but it is evident that the controlling conditions at Jupiter are essentially different from those which prevail at both Tampa and Key West.

The great majority of thunderstorms at Jupiter move from the southwest to the northeast—from the land to the ocean; the prevailing direction at Tampa is not so well marked, but it is evidently from the east and southeast—from the land to the ocean—as at Jupiter. The irregularity of movement at Tampa, as shown by the table, may be accounted for by assuming that the local circulation is at times within the influence of the general easterly drift of the atmosphere and again controlled by the westerly movement of the air within the Tropics. The more probable explanation, however, would seem to be that the movement of individual thunderstorms is controlled by the pressure distribution and other local influences.

Comparing the direction of progression on the two sides of the peninsula it is found that the majority of storms on either side approached from the landward side of the point of observation where the conditions of thunderstorm formation are most favorable.

Strong evidences of local control of thunderstorm movement appear in the statistics for Titusville, Pensacola, and Savannah. While there is a general easterly movement in each of these cases, as over the adjoining territory, there is, on the other hand, such a preponderance of storms from one particular direction as to be explicable only on the ground of local influences.

At all of the stations examined, except Key West and Tampa, there is a noticeable absence of storms moving from the east, and this is true whether the station is situated on the coast or inland.

There does not appear to be any definite relation between surface winds and the direction of thunderstorm movement. During August and September the influence of the northeast trades is felt as far north as the Carolina coast; the prevailing northeasterly and easterly winds do not, however, during these months, appear to exert any appreciable effect on the direction of thunderstorm movement.

Percentage of thunderstorms that have been observed moving from each of the eight principal points of the compass, January, 1892, to September, 1896.

	N.	NE.	E.	SE.	S.	SW.	W.	NW.
New Orleans	5	13	4	16	9	41	6	5
Mobile	8	9	4	17	12	20	15	15
Montgomery	5	7	4	4	3	32	25	21
Pensacola	4	21	5	5	6	27	6	25
Tampa	4	8	21	17	11	16	16	7
Key West	3	11	35	19	15	10	7	1
Jupiter	7	5	5	10	10	37	14	12
Titusville	1	0	2	3	7	53	10	24
Jacksonville	4	13	3	10	5	29	14	21
Savannah	3	4	1	2	7	28	42	12
Atlanta	13	7	4	4	3	27	24	19
Wilmington	4	12	3	5	4	29	14	29
Charlotte	12	8	1	3	10	23	25	16
Hatteras	1	2	5	8	6	30	29	19

The table below shows the distribution of thunderstorms throughout the year. As before stated, the period of maximum frequency falls in July and August at all stations except Jupiter, Charlotte, and Montgomery. At the first named a primary maximum occurs in May and June, with a secondary maximum in August. At Charlotte the maximum occurs in June and July, while at Montgomery (and also in a less marked degree at Mobile) the maximum period includes the three summer months June, July, and August. Winter thunderstorms occur mostly at New Orleans, Mobile, and Montgomery. The record for Pensacola is incomplete, the direction of motion of a large number of storms not being recorded.

Number of thunderstorms of which the direction of motion was observed from January, 1892, to September, 1896.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
New Orleans, La	3	6	10	10	24	25	38	38	11	1	1	4	171
Mobile, Ala	6	10	13	10	32	42	56	70	18	6	1	3	267
Montgomery, Ala	3	5	12	18	29	43	39	37	4	3	4	6	203
Pensacola, Fla	2	4	6	4	14	12	27	20	9	0	0	1	99
Tampa, Fla	3	3	6	5	15	20	34	36	6	0	2	2	132
Key West, Fla	2	3	1	3	6	17	38	53	23	5	3	0	154
Jupiter, Fla	2	2	7	13	22	21	11	19	6	6	1	0	110
Titusville, Fla	0	1	6	10	27	30	46	46	22	3	3	2	196
Jacksonville, Fla	4	5	5	13	24	33	55	79	22	2	1	1	244
Savannah, Ga	2	2	7	8	26	36	64	69	11	0	2	1	228
Atlanta, Ga	1	2	5	8	11	16	25	31	1	1	1	1	103
Wilmington, N. C	2	1	8	15	30	32	54	31	10	3	1	1	188
Charlotte, N. C	1	0	2	18	26	35	35	28	14	0	3	1	163
Hatteras, N. C	0	1	7	7	18	15	24	16	4	3	0	2	97

LOW PRESSURE IN ST. LOUIS TORNADO.

By JULIUS BAIER.

In a footnote, on page 77 of the REVIEW for March, 1896, Mr. Frankenfield gives a preliminary note as to the low pressure observed at the center of the St. Louis tornado by a son of Mr. Klemm. On account of the interest that attaches to any such observation, a special study of the subject has been made, at his request, by Mr. Julius Baier, a civil engineer of St. Louis, whose report we herewith give in full. Mr. Frankenfield, to whom the report is addressed, states that the minimum reading, 671 mm., with an uncertainty of 5 mm. either way, when reduced to sea level gives a reduced reading of 26.94 inches, with an uncertainty of 0.20 inch, which pressure is lower than his estimate of 27.30, as published in the March REVIEW. Mr. Baier's report is as follows:

The barometer and also a thermometer were fastened to a carved wooden frame and at the time of storm hung near the window on the first floor of the home of the late Richard Klemm, ex-park commissioner of the city. As the storm struck the house a son of Mr. Klemm who was sitting in the room at the time was startled, on looking toward the window, to see the index hand of the barometer almost opposite its usual position, that is, pointing almost vertically downward. This was immediately preceding the damage to the roof, upper walls, and contents of the house and the general excitement incident to the same. The barometer was picked up from the floor after the storm, but only the wooden frame had been injured. The observation is dependent, not on reading and remembering the figures on the scale, but on noting a definite position of the index hand, a fact which would readily impress itself on the mind and be easily remembered. [Accompanying sketch, showing aneroid face and probable position of the index is not reproduced.]

Through the courtesy of Prof. F. E. Nipher, I have recently tested the barometer under reduced pressure at the physical laboratory of the Washington University. I inclose a copy of the results in detail as well as a sketch showing graduations on the scale of the instrument. The pressure was run down once and up three times with fairly uniform results, as compared with readings of the level of the mercury in a U-tube gauge. The large error of instrument at the lower readings is probably due to the fact that the recording mechanism is near its limit. Readings in column No. 1 were taken while reducing the pressure; No. 2, while gradually raising the pressure; Nos. 3 and 4 were taken by successively exhausting to the lowest point and then making the index balance for some little time at each reading as the pressure was raised. [Probably this means that the aneroid index and the mercury gauge stood at the same readings for some little time.] The last reading was made with greatest care and given most weight in averaging. Observations correct within one or two millimeters.

I think it is safe to assume an observed reading of, say, 685 mm., which when corrected, becomes 671 as the actual pressure [for the minimum pressure, May 27, in the center of the tornado], with possible error of, say, 5 mm. either way. The instrument has on it the name of W. Schrieb, Heilbrom.

Comparisons of aneroid with a mercury gauge.—The initial barometer pressure in the laboratory, *i. e.*, that pressing on the outside of the mercurial gauge, was derived as follows: Mercurial barometer 29.47 inches, or 748.5 mm.; attached thermometer 75° F.; correction for temperature 3.2 mm.; corrected mercurial barometer of the physical laboratory, 745.3 mm., which corresponds to the reading 0 mm. on the mercury gauge. As the pressure was diminished within the receiver of the air pump the amount of exhaustion was indicated both by the rise in the readings of the mercury gauge and by the fall in the readings of the inclosed aneroid. The comparative readings are shown in the following table:

Aneroid.		Mercury gauge.					Correction to aneroid.	Pressure by corrected aneroid.
Reading.	Fall.	Readings. 1	2	3	4	Mean.		
mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
745	0	0	0	0	0	0	0	745
720	25	26	26	......	......	26	— 1	719
715	30	34	32	......	......	32	— 2	713
710	35	......	38	......	......	38	— 3	707
705	40	44	44	......	43	43	— 3	702
700	45	......	50	......	......	50	— 5	695
695	50	58	58	......	56	56	— 6	689
690	55	......	67	63	66	65	—10	680
685	60	76	74	74	73	74	—14	671
680	65	......	85	83	83	83	—18	662

[Owing to the imperfect elasticity of the ordinary aneroid boxes the corrections deduced from comparisons rapidly made in a vacuum chamber are not always applicable to observations made under the slower changes that occur in the natural atmosphere. In the present case, however, the corrections deduced by Mr. Baier are probably more accurate than the original observation by Mr. Klemm.—ED.]

EARLY EXPERIMENTS IN ATMOSPHERIC ELECTRICITY.

By Prof. CHARLES E. WEST.

From a historical point of view the meteorological observers of America will always retain an interest in the work of Prof. Joseph Henry, who, during his extensive magnetic researches, found occasion to turn his attention to meteorology and atmospheric electricity. Although he has himself published some account of his work, yet, as in the case of his friend, Prof. Arnold Guyot, there is a widespread conviction that, through an excess of modesty, as well as through a willingness to be helpful to others (to say nothing of some cases of actual robbery), he has frequently failed to be credited with important scientific discoveries. Possibly, therefore, the following letter will be of interest as coming from Mr. Charles E. West, one of the oldest members of the American Association for the Advancement of Science; the letter is dated Brooklyn, N. Y., October 9, 1896:

You desire me to give, for publication in your REVIEW, some remarks made by me at the meeting of the A. A. A. S. in Buffalo, last summer, concerning certain electrical experiments made in my laboratory in New York, July, 1842.

I copy from my notebook:

Among my warm personal friends was Joseph Henry, of Washington. I made his acquaintance in 1842. In the summer of that year he spent several days with me in experimenting on atmospheric electricity, to show the inductive action of lightning in magnetizing sewing needles or other pieces of steel. A helix of copper wire, insulated by being inclosed in cotton, was made with an opening in the center large enough to receive an ordinary sewing needle. The helix was fastened near the window of my laboratory, and a wire of like kind, attached to the upper end of the helix, extended from it to the tin roof of the building, to which it was soldered. A similar wire from the lower end of the helix passed down to the bottom of a deep well in the yard.

We were then ready for a thunderstorm. There came up a shower off in the direction of the Palisades, in New Jersey. A needle was inserted into the helix. After the lightning's flash it was withdrawn and found to be a permanent magnet. Needle after needle was thus treated, during the shower, and made magnetic.

Here is a copy of the professor's directions:

"When you see the flash, draw out the needle and count one, two, three, etc., until you hear the thunder. If five seconds elapse, the electric discharge will be a mile off. When you hear the thunder, apply the needle, and if it attracts, put it on the paper for future reference.

"1. If the lower end or the eye of the needle attracts the north pole, the electricity went from the cloud to the earth.

"2. If the lower end of the needle repels, then the electrical discharge passed from the earth to the cloud."

Our first experiment was made July 9, 1842; our second, July 20, and our third, July 24.

For a year or two I repeated these experiments, and sent the needles to Professor Henry, at his residence in Princeton. The helix and some of the needles are still in my possession.

Such, in brief, is the story of an interesting incident of my acquaintance with one of our greatest American scientists.

I occasionally visited him, and spent many profitable hours in his laboratory. We frequently corresponded on scientific subjects. After his death, I read a paper before the American Ethnological Society of New York, May 27, 1878, entitled, Remarks upon the Electrical Researches, etc., of Joseph Henry, LL.D., late secretary of the Smithsonion Institution, of Washington, D. C., in which I endeavored to express my appreciation of his distinguished scientific abilities and his exalted and distinguished Christian character.

THE INTERNATIONAL METEOROLOGICAL CONFERENCE IN PARIS.

By ROBERT H. SCOTT, Sec. Int. Met. Committee.

As has already been announced, this meeting was held in September, under the presidency of Professor Mascart, and lasted seven days (September 17–23, inclusive). The last meeting of a similar character had been held in Munich in 1891. The Paris meeting was attended by some forty members. Canada and Mexico were represented for the first time; neither Spain, Portugal, Brazil, nor the Argentine States were represented. The Weather Bureau, Washington, sent no one; Mr. Page came from the Hydrographic Office, Washington, but only in a private capacity.

Dr. Hann's absence from the meeting, on the ground of health, was universally regretted.

The programme for discussion consisted of over forty questions, and to these Mr. Wragge, of Brisbane, proposed to add more than a score; but several of his applications were ruled as *ultra vires* for the Conference. Some of the questions on the programme were set aside as either reopening discussions which had been closed years ago, or as being impossible of acceptance; as, for instance, one as to the adoption of a period of 26.67928 days for all meteorological and magnetical phenomena.

The business really done, was, in brief:

Committees were appointed, as already announced (Nature, October 1), to carry on investigations into (1) terrestrial magnetics and atmospheric electricity; (2) cloud observations; (3) balloon ascents; (4) sunshine and radiation.

It was recommended, at the suggestion of Mr. Symons, that systematic comparisons of different forms of thermometer exposure be carried out generally, Assmann's apparatus for ventilated thermometers to be one of the forms tested.

The Conference declined to make any recommendation as to a standard anemometer, or as to anemometer exposure.

Several applications were made to the Conference to exert, by resolutions, pressure on governments with a view to the obtaining of grants for investigations; but these were ruled as *ultra vires*. Mr. Wragge's requests for stations in Tasmania, and for observations on Mount Wellington, Tasmania, and also on Mount Kosciusko, in Australia, were met by the general declaration that the Conference must welcome the establishment of good stations all over the world.

Dr. Neumayer's proposals to modify existing systems of meteorological telegraphy in Europe were not accepted.

Four questions as to the discussion of phenomena in cyclones were held to be purely theoretical, and therefore unsuitable for discussion at a conference.

Professor Mohn submitted some proposals as to the use of the hypsometer. No discussion ensued, but Professor Mohn's paper will be printed in the appendix to the report of the Conference.

Dr. Paulsen, of Copenhagen, exhibited monthly ice charts of the North Atlantic north of the sixtieth parallel, and received a promise of assistance in their completion from the members present, who were in a position to obtain observations of ice.

Dr. Snellen, of Utrecht, requested the Conference to take measures for convening a new maritime conference, to carry on further the work done at the London Conference of 1874. This matter was referred to the international committee.

The chief feature of the Paris meeting was the attention paid to the terrestrial magnetism and atmospheric electricity. The committee appointed for these subjects held three meetings, of which the minutes will shortly appear, and, as has already been stated, a committee has been nominated to carry on the discussion of various points which have been raised.

Finally, the international meteorological committee has been reappointed with a few modifications, owing to resignations, etc. Its members now are:

Dr. von Bezold (Germany).
Dr. Billwiller (Switzerland).
Admiral Capello (Portugal).
Mr. Davis (Argentine Republic).
Mr. Eliot (India).
Professor Hann (Austria).
M. Hepites (Roumania).
Professor Hildebrandsson (Sweden).
Professor Mascart (France), *President*.
Professor Mohn (Norway).
Prof. W. L. Moore (United States).
Dr. Paulsen (Denmark).
Mr. Russell (New South Wales).
Major-General Rykatcheff (Russia).
Mr. Scott (England), *Secretary*.
Dr. Snellen (Holland).
Professor Tacchini (Italy).

NOTES BY THE EDITOR.

ESPY AND THE FRANKLIN KITE CLUB.

In response to a letter from the Editor inquiring about the history of the Franklin Kite Club, Dr. Wahl, Secretary of the Franklin Institute, has been making some inquiries through the columns of the Philadelphia Ledger, and although his investigation is not yet complete, yet some facts have been elicited which are of general interest in view of the certainty that hereafter the kite will be an important accessory in meteorological explorations of the atmosphere.

The Franklin Kite Club is referred to by Prof. James P. Espy in his Philosophy of Storms, published in 1841. It is there stated, page 167, that a report was made by the Franklin Kite Club in which they announce the discovery that on those days when columnar clouds formed rapidly and numerously their kite was frequently carried upward nearly perpendicularly by columns of ascending air, and that this circumstance became so familiar during the course of their experiments that on the approach of a columnar cloud, just forming, they could predict whether it would come near enough to affect their kite, for if the cloud did not pass directly over the kite, the latter would only move sideways toward the cloud. This paragraph was apparently written in the winter of 1837–38, and the report of the club probably referred to the year 1837.

Even before this time Espy seems to have flown his own kite in order to test his formula for calculating the height of a cloud, for on page 75, in a paragraph that was written before September, 1834, he says:

> Since writing the above a kite was sent up into the base of a cloud, and its height ascertained by the sextant and compared with the height calculated from the dew-point, allowing 100 yards for every degree that the dew-point was below the temperature of the air; and the agreement of the two methods was within the limits of the errors of observation. In this case the base of the cloud was over 1,200 yards high. Moreover the motions of the kite, whenever a forming cloud came nearly over it, proved an up-moving column of air under it. I speak of cumulus clouds in the form of sugar loaves with flat bases.

The following items relative to the history of the Franklin Kite Club are extracted from the Philadelphia Ledger of October 6, 1896.

> The Ledger has made diligent search for some record of the Club, and has learned that such a club did, undoubtedly, exist; but whether as an organized body or not can not yet be determined. It was contemporary with the Archery Club, which flourished about 1840. So far as can be learned the kiteflying was conducted simply for recreation, but from the well-known character of the people who took part in the sport it is more than likely that there were some among them who took a scientific interest in the matter, and who would have reported any discoveries they might have made.
>
> From Charles J. Hayes, the well-known landscape engineer, it is learned that Franklin Peale was a prominent member of the Kiteflying Club, and had a large box in which the kites were kept, which box Mr. Hayes now has in his possession. The kites have long since disappeared. The club had regular times for the sport, and used to go out on the hills at Fifteenth and Green streets, and to Pratt's Gardens, where the Lincoln Monument now stands in Fairmount Park. Mr. Hayes was a member of the Archery Club, which also frequented the same grassy fields for its sport, and on many occasions saw the kites raised, and often took part in the sport. They were mostly imported from China, and were made in fantastic shapes and were gaudily painted. The "man kites" represented men in flowing coats and with rolling eyes. They would be flown so as to hover over vessels on the Schuylkill, exciting terror or mirth in the spectators or occupants of the boats. Snakes and dragons were also among the forms assumed by these toys. The box of kites finally found a resting place at the residence of Mr. Baldwin, of locomotive fame, at Wissinoming, where the club used to go from time to time to fly them. Peale owned them. Mr. Hayes had no knowledge of any scientific use being made of the sport.
>
> Mr. Horace Sellers says that his uncle, George Escol Sellers, remembers the interest taken in kiteflying by the members of the Archery Club, but has no recollection of any special organization. According to his recollection Franklin Peale, Baldwin Keyser, Samuel Griffiths, and Harvey L. Sellers were among the members of the club who took part in the kiteflying experiments. He remembers hearing of a sled being rigged up one winter so as to be drawn by kites when there was unusually good skating on the Delaware. He also refers to kites made by Franklin and Linnæus Peale at their father's home in Germantown. He recalls one large kite, 5 feet by 3 feet, covered with tough hardware paper, which was controlled by a reel swivelled at the top of a post back of the barn. He says that one day they placed a kitten in a basket attached to a parachute hung to the tail of this kite, and by means of lighted Chinese punk arranged to burn the string after a certain interval. The basket was made to fall, and the parachute opening before reaching the ground the kitten was safely landed.
>
> This recollection of Mr. Sellers would go to show that scientific experiments and sport were combined when the club went out for exercise on pleasant afternoons. If it could be established that the club experimented in meteorological matters it would now have a great historical and scientific interest, in view of the present experiments of the Government Weather Bureau in the employment of kites for the study of atmospheric phenomena.

ISOBARS AND THEIR ACCURACY.

The charts published in the MONTHLY WEATHER REVIEW present monthly and annual and sometimes normal isobars for the years and months. These lines are irregular curves, and in comparing them with the monthly resultant wind direction, one is often forced to ask himself how reliable are the minuter details in these curves, and to what extent must the lines be literally followed in order to get a correct idea of the relation between the pressure and the wind. In a general way we know that the wind blows around and in toward the center of a region of low pressure, and we are rather surprised to find that what is true in the stormy portions of a daily weather map is not also universally true on the maps of monthly isobars and winds. Thus if we follow along the isobar of 30.00 for 1895, as shown on Chart I of the summary for that year, we find seven cases where the wind arrows blow from the higher toward the lower side of this line, and also seven where the wind arrows blow from the lower toward the higher side. Several of these exceptional cases occur in the Dakotas, where the 30.00 line has a double curvature, making two loops or bights, and similar loops are found in other isobars on this map, as well as in the isobars drawn by Mr. Morrill and published on Chart IV of the same issue.

The reliability of isobars must depend, primarily, on that of the barometers in use at the station, secondarily on the method of reduction to sea level, and finally on the judgment of the student who draws the lines as published. The sources of uncertainty and the extent to which each may affect the result are about as follows:

1. Uncorrected errors within the instrument, such as the so-called zero of the scale, the capillarity, the error of the attached thermometer, the difference between the temperature shown by the attached thermometer and the real temperatures of the mercury and the scale. The sum total of all these, if they should accidentally happen to work in the same direction, might amount to several hundredths of an inch but they generally counterbalance each other and the outstanding average effect for the month is supposed not to exceed plus or minus 0.01.

2. The use or the neglect of the correction for the variation of local gravity from its standard or average value at sea level and 45° of latitude. This correction for gravity is, properly speaking, an instrumental correction, it is peculiar to the mercurial barometer and does not apply to the aneroid barometer. This correction is frequently neglected so that most of the published isobars show apparent and not standard pressures. The extent to which the neglect of this correction affects the isobars depends upon the latitude of the

station, the altitude of the barometer above sea level and the existing pressure. So far as latitude is concerned its influence for 30 inches of mercury is given by the figures printed on the right hand side of each map of isobars and the correction varies from plus 0.027 inch at latitude 55°, to minus 0.061 inch at latitude 20°. The correction has its full value, just given, at any station when the pressure is 30 inches and increases or diminishes exactly in proportion as the pressure departs therefrom; it has, therefore, two-thirds of its value when the pressure is 20 inches and it has one-thirtieth more than its full value when the pressure is 31 inches. As concerns altitude, the correction increases algebraically but slowly with altitude. If the force of gravity were determined at every station, as it easily could be, a somewhat more correct value of the influence of this source of error would be known.

3. The isobars depend upon pressures that "have been reduced to a sea level." This reduction is made for the purpose of, at least approximately, annulling the influence of the height of the station, thereby making the reduced pressures more nearly comparable than are the actual station pressures. This would be unnecessary if the stations were all at the same altitude, and it becomes a very uncertain hypothetical quantity when the stations vary in altitude from sea level up to 7,000 feet, as is the case in the present American system. Other things being equal, the uncertainty of the reduction to sea level must increase with altitude. For the averages of a month or a year the methods or systems of reduction used by conservative students will differ 0.10 inch for an elevation of 5,000 feet, and 0.01 for an elevation of 1,000 feet.

4. Besides the uncertainty due to methods, the reduction to sea level is also uncertain because of unknown errors in the adopted elevations of the barometers at the stations. The greater part of the elevations used by the Weather Bureau depend upon levelings made with spirit levels by railroad and canal engineers. Many discrepancies occur among these levels; very few of our altitudes are considered reliable to within 10 feet, and an uncertainty of 20 feet in the elevation, or 0.02 inches in the reduced barometer is considered a fair index to the accuracy of the elevation in the interior of the country; in a few special cases it far exceeds this.

5. In view of the preceding it is not proper to publish reduced observations to a greater degree of refinement than the nearest 0.01 of an inch, although the preliminary calculations are all made to the nearest thousandth, consequently the published figures even at the low stations have an uncertainty of plus or minus 0.005 due to the adoption of the nearest whole hundredth, whereas they might agree to within one or two thousandths if the third decimal had been retained on the charts.

In view of the preceding the student who has charted his pressures reduced to sea level and is about to draw the isobars for every 0.05 of an inch of pressure may well ask how closely his pencil must follow the figures that his eye interpolates between the charted numbers. As he wishes to show the narrow belt over which the pressure is 30.05 and as his pencil traces accurately the 30.05 line in among the maze of figures a little larger or smaller than this, he is perpetually oppressed by the conviction that a little wavering to the right or left can do no harm because the figures are slightly uncertain. When he finally has traced upon his map several loops or bights, such as those shown in the annual maps for 1896, there is a strong temptation to wipe them out and replace these by a smoother generalized line; a temptation that is intensified when he perceives that the winds, which, according to our preconceived ideas ought to have a simple relation to these isobars now appear to be entirely independent of them.

Now the well-recognized proper way of presenting any data that results from observation is to follow the numerical results strictly, but to accompany them with some indication of their probable reliability. Thus in the present case the isobars represent closely a rigorous interpolation between the charted numbers, but the lines thus interpolated have different degrees of reliability depending upon the several sources of uncertainty above enumerated: this uncertainty can be best represented on a chart by a shaded area extending equally on either side of the isobar to a distance representing the supposed uncertainty of 0, 1, 2, 3, etc., hundredths of an inch. Such shading would probably not look well on the published maps, but can easily be supplied by any special student. When the shaded areas approach each other closely, or overlap, then we know that the reduced pressures within the shaded region are too uncertain to justify reliance upon the isobar drawn within it. In such cases we must seek to combine the pressures at several neighboring stations into one normal that shall be more reliable than any one of the individual pressures. By using several such normals isobars may be drawn that shall give some idea of the distribution of pressure at sea level. In respect to the bights and loops on the annual chart in the MONTHLY WEATHER REVIEW for 1895, the shaded areas do sometimes overlap in the Rocky Mountain Region, where the isobars on Chart I show dotted lines, but the bights in the Missouri Valley, on Charts I and IV, still remain, although they might plausibly be made less pronounced. We conclude, therefore, that in the study of isobars and isotherms, as in the study of every other matter that results from observation, one must always present the figures correctly, but guard against drawing conclusions finer than are warranted by the reliability of the data.

THE FIRST ATTEMPT TO MEASURE WIND FORCE.

Meteorological observers, especially those who have studied the development of anemometry, will recall the fact that the most simple and direct measurement of the velocity of the wind is made by observing the speed of light bodies, such as feathers or soap bubbles carried along by it. The first piece of apparatus applied to the measurement of the wind was the pendulous plate anemometer introduced by the Royal Society about 1665 on the recommendation of Sir Christopher Wren, Robert Hooke, and others, who constituted a committee on meteorological observations. This instrument gave a measurement of the effect of moving air on a resisting plate from which the velocity can perhaps be calculated. In using this and almost all other apparatus which measures some definite effect of the wind it is assumed that the wind blows upon the apparatus long enough to bring its moving parts into a steady condition, either of motion or of resistance, so that we measure the maximum effect that a given wind is capable of producing. Prof. C. F. Marvin has called our attention to the fact that meteorology owes another ingenious method to Sir Isaac Newton. This eminent philosopher was for many years engrossed in the study of forces; he it was who first saw that the proper method of measuring and comparing forces among themselves is to measure the amount of energy that each force when acting continuously can communicate in a unit of time to a unit mass of freely moving matter. It seems to have occurred to him to apply this idea to the resistance of the wind. When a body is falling freely through the air the resisting force of the air sometimes erroneously called friction is brought into play; this resistance can be expressed by the amount of retardation experienced by a falling body whose mass and resisting area are, respectively, unity. Newton also applied this same idea to an ingenious method of determining the relative strength of the various winds. His experiments in this line are narrated at page 15 of Sir David Brewster's Memoir of the Life, Writings, and Discoveries of Sir Isaac Newton, whence we take the following:

It was about this time, also, that he seems to have paid some attention to the subject of the resistance of fluids, to which his experiments with water wheels would naturally lead him. Mr. Conduit, apparently on the authority of Mrs. Vincent, informs us that even when he was occupied with his paper kites, he was endeavoring to find out the proper form of a body which would experience the least resistance when moving in a fluid. Sir Isaac, himself, told Mr. Conduit that one of the earliest scientific experiments which he made was in 1658,[1] on the day of the great storm [September 3] when Cromwell died, and when he himself had just entered into his sixteenth year. In order to determine the force of the gale he jumped first in the direction in which the wind blew, and then in opposition to the wind; and after measuring the length of the leap in both directions, and comparing it with the length to which he could jump in a perfectly calm day, he was enabled to compute the force of the storm. Sir Isaac added, that when his companions seemed surprised at his saying that any particular wind was a foot stronger than any he had known before, he carried them to the place where he had made the experiment, and showed them the measures and marks of his several leaps. This method of jumping to a conclusion, or reaching it *per saltum*, was not the one which our philosopher afterward used. Had he, like Coulomb, employed a shred of paper instead of his own person, and observed the time it took to fly through a given distance, he would have obtained a better substitute for an anemometer.

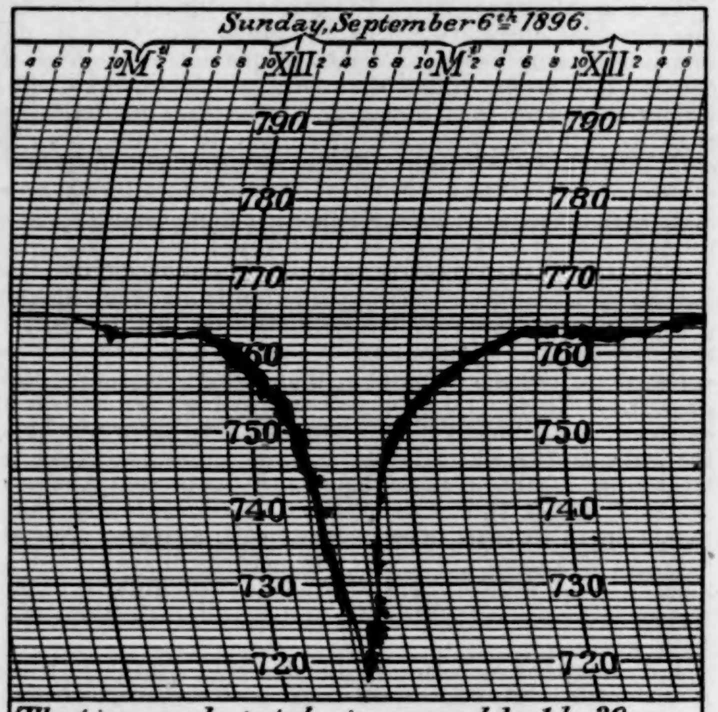
The reader will perceive that provided one jumps with the same force first with and then against the wind he may take half the difference of the two distances as being the effect of the wind in carrying him along while he is in the air. The wind acts upon him continuously during this brief interval just as gravity acts continuously upon any falling body. If, indeed, the observer simply jumps vertically upward or, still better, if he lets an inanimate spherical ball fall vertically downward and observes the amount of horizontal movement he has a direct measure of the force or pressure whence he may calculate the velocity of the wind. There are several reasons why such calculated velocities are rather rough compared with the results given by other methods, but it is certainly of the highest interest to find that Sir Isaac Newton in his boyhood, and before he could have known anything of Galileo's work, devised this simple method of estimating the energy and velocity of the wind.

BAROGRAM NEAR A HURRICANE CENTER.

Mr. A. Rouilliard, engineer in charge on the S. S. *Francois Arago*, has kindly sent the Weather Bureau a photograph of the Richard barograph curve for the time when the steamer crossed the hurricane center northeast of the Bahama Banks on September 6; a similar copy was sent by Captain Tissier to the Hydrographic Office and is published on its Pilot Chart. Mr. Rouilliard says:

> We have been right in the center of the hurricane and suffered considerable damage; two boats carried away, one man overboard, steam steering gear and hand steering gear both broken. In order to get out of the center we had to make our rudder fast with blocks and ropes in such a way that the helm was hard on port, this to keep the wind on the starboard bow, steering only with the engine which we kept more or less slow.

The following diagram, showing the barometric pressure during the 6th, apparently has its original time scale adjusted to the local time of some meridian a little to the eastward and Mr. Rouilliard says that time data should be increased by one hour and thirty minutes, probably, in order to get correct local mean time, or by one hour and thirty-one minutes to get seventy-fifth meridian time, or subtract three hours and twenty-nine minutes to get correct Greenwich time.



The time-scale is to be increased by 1 h. 30 m.

The first signs of a hurricane appear on the barometric sheet by the rapid fall beginning at 10 p. m. September 5, and the vessel had completely left the influence of the hurricane by 10 a. m. September 7. The position of the center of the hurricane at 9 p. m. September 6 was latitude 28° 50′ north, longitude 77° 0′ west of Paris, or 74° 40′ west of Greenwich, at which time the center was about 220 nautical miles distant from the vessel; this location is based upon an estimate of the position of the steamer at noon of September 7. The lowest pressure was recorded at 6.30 p. m. of the 6th, viz, 717.3 mm. (28.24), which must, therefore, have been very near the center of the hurricane. Nothing is stated as to the corrections to the barograph at this pressure. If we assume that the navigator was sailing northward, while the hurricane center was moving toward the northeast, we find that the vessel was in the southeast quadrant of the storm and approaching the center up to 6 p. m. of the 6th, and that after 8 p. m. it was in the northwest quadrant and receding from the center. This explains the fact that the accompanying barogram shows a somewhat more rapid fall in the course of the eight or ten hours preceding the center than during the same interval of time after the center had passed.

METEOROLOGICAL TABLES.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

Table I gives, for about 130 Weather Bureau stations making two observations daily and for about 20 others making only the 8 p. m. observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation.

Table II gives, for about 2,400 stations occupied by voluntary observers, the extreme maximum and minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indi-

[1] Sir Isaac was born in 1642, December 25, old style.

cated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for about 30 Canadian stations, the mean pressure, mean temperature, total precipitation, prevailing wind, and the respective departures from normal values. Reports from Newfoundland and Bermuda are included in this table for convenience of tabulation.

Table IV gives detailed observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, meteorologist to the Government Survey.

Table V gives, for 26 stations, the mean hourly temperatures deduced from thermographs of the pattern described and figured in the Report of the Chief of the Weather Bureau, 1891–'92, p. 29.

Table VI gives, for 26 stations, the mean hourly pressures as automatically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891–'92, pp. 26 and 30.

Table VII gives, for about 130 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891–'92, p. 19.

Table VIII gives the danger points, the highest, lowest, and mean stages of water in the rivers at cities and towns on the principal rivers; also the distance of the station from the river mouth along the river channel.

Table IX gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division one may obtain the average resultant direction for that division.

Table X gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table XI gives, for 38 stations, the percentages of hourly sunshine as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table XII gives a record of the heaviest rainfalls for periods of five and ten minutes and one hour, as reported by regular stations of the Weather Bureau furnished with self-registering rain gauges.

Table XIII gives the record of excessive precipitation at all stations from which reports are received.

Additional information concerning the tables will be found in the REVIEW for January, 1895.

NOTES EXPLANATORY OF THE CHARTS.

Chart I.—Tracks of centers of low pressure. The roman letters show number and order of centers of low areas. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. The queries (?) on the tracks show that the centers could not be satisfactorily located. Within each circle is given the lowest barometric reading reported near the center. A blank indicates that no reports were available. A wavy line indicates the axis of a trough or long oval area of low pressure.

Chart II.—Tracks of centers of high pressure. The roman letters show number and order of centers of high areas. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. The queries (?) on the tracks show that the centers could not be satisfactorily located. Within each circle is given the highest barometric reading reported near the center. A blank indicates that no reports were available. A wavy line indicates the axis of a ridge of high pressure.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level isobars, surface isotherms, and resultant winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are not reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and correspond to Professor Hazen's system of reduction; the barometer is not reduced to standard gravity, but the necessary reduction for 30 inches of the mercurial barometer is shown by the marginal figures for each degree of latitude.

Chart V.—Kite experiments at Blue Hill Observatory.

Chart VI.—Record by meteorograph during kite ascension of October 8, 1896, at Blue Hill Observatory.

TABLE I.—*Climatological data for Weather Bureau Stations, September, 1896.*

Stations.	Elevation above sea-level, feet.	Length of record, years.	Pressure in inches. Mean pressure, 8 a. m. and 8 p. m. ÷ 2.	Pressure: Mean reduced.	Pressure: Departure from normal.	Temperature of the air, in degrees Fahrenheit. Mean max. and min. ÷ 2.	Temp.: Departure from normal.	Temp.: Maximum.	Temp.: Date.	Temp.: Mean maximum.	Temp.: Minimum.	Temp.: Date.	Temp.: Mean minimum.	Temp.: Greatest daily range.	Humidity and precipitation. Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Precip.: Departure from normal.	Days with .01, or more.	Wind. Total movement, miles.	Wind: Prevailing direction.	Maximum velocity: Miles per hour.	Maximum velocity: Direction.	Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Monthly temperature data since opening station. Absolute maximum.	Year.	Absolute minimum.	Year.
New England.						60.4	− 0.6										5.50	+ 2.3														
Eastport	76	24	29.96	30.05	+ .02	54.6	− 0.6	73	11	60	37	24	49	19	49	85	3.67	+ 0.5	12	6,838	s.	39	se.	6	3	15	12	6.9	83	1889	36	1888
Portland, Me	103	25	29.91	30.01	− .04	57.7	0.0	79	11	65	36	24	51	24	54	88	9.57	+ 6.5	14	5,280	s.	30	s.	30	8	8	14	6.5	94	1881	33	1888
Northfield	872	10	29.11	30.05	− .02	54.9	− 1.2	90	11	67	29	29	43	35	49	84	3.48	+ 0.7	13	5,964	s.	28	n.	20	6	13	11	6.3	90	*	25	*
Boston	125	26	29.91	30.05	− .02	62.2	+ 0.1	90	11	70	40	24	55	25	54	79	6.40	+ 3.5	14	8,058	sw.	41	ne.	10	10	8	12	5.8	102	1881	34	1879
Nantucket	14	10	30.03	30.04	− .06	61.8	− 1.1	76	12	67	47	24	57	16	56	85	2.06	− 1.2	14	8,991	sw.	55	s.	10	11	7	12	5.7	86	1895	41	1888
Woods Hole	......	19	......	......	......	62.0	− 1.4	74	6	66	46	24	58	15	......	......	5.66	+ 2.5	13	10,862	s.	48	nw.	10	14	6	10	4.9	84	*	39	1888
Vineyard Haven	......	10	......	......	......	63.7	− 0.7	81	11	70	45	24	57	19	......	......	6.63	+ 2.0	12	......	sw.	....	......	...	9	3	18	....	91	1895	38	1889
Block Island	27	17	30.02	30.05	− .03	62.4	− 0.3	74	11	67	44	23	58	16	57	85	7.76	+ 4.8	11	12,566	sw.	75	ne.	9	7	14	9	5.6	86	1881	42	1883
Narragansett Pier	......	15	......	......	......	61.4	− 0.8	76	12	68	35	24	55	28	......	......	6.30	+ 3.6	12	......	se.	....	......	...	13	6	11	....	89	1882	32	1888
New Haven	107	24	29.92	30.04	− .05	62.9	+ 0.5	84	11	71	38	24	55	28	56	81	3.42	− 0.3	11	7,235	n.	39	se.	30	12	5	13	5.4	100	1881	32	1888
Mid. Atlan. States.						67.6	− 0.1										3.66	− 0.3														
Albany	85	23	29.96	30.05	− .02	62.2	− 0.7	90	11	72	40	23	52	28	53	77	3.31	− 0.1	9	5,888	s.	36	se.	30	13	9	8	5.2	97	1895	33	1879
New York	314	26	29.71	30.04	− .05	64.8	− 1.4	86	10	72	43	23	58	24	56	80	3.04	− 0.7	9	9,871	nw.	56	se.	30	11	10	9	5.2	100	1881	36	1872
Harrisburg	377	9	29.65	30.06	− .06	66.0	+ 1.6	91	11	76	42	23	56	33	55	74	1.81	− 2.3	10	4,885	e.	72	s.	30	14	4	12	4.7	94	1895	36	1888
Philadelphia	117	26	29.94	30.06	− .04	67.8	+ 0.2	92	11	76	44	23	59	31	56	72	2.76	− 0.5	11	7,139	sw.	42	se.	30	11	8	11	5.3	102	1881	40	1888
Baltimore	123	26	29.92	30.04	− .06	68.4	+ 0.2	94	19	77	46	*	60	34	56	69	4.14	+ 0.3	10	3,453	sw.	36	e.	29	10	10	10	5.0	101	1881	39	1888
Washington	112	26	29.94	30.06	− .05	67.8	+ 0.4	94	19	78	42	24	58	37	59	78	3.18	− 0.5	12	4,301	s.	66	se.	29	14	9	7	4.1	104	1881	38	1879
Cape Henry	......	23	......	......	......	72.0	− 0.4	95	18	78	52	25	66	26	......	......	4.17	− 0.7	9	......	se.	....	......	...	9	15	6	....	96	*	49	*
Lynchburg	685	26	29.35	30.08	− .01	68.7	− 0.2	96	18	79	39	24	58	34	58	76	7.08	+ 3.3	10	2,382	e.	34	nw.	29	12	8	10	4.6	99	1895	35	1888
Norfolk	57	26	30.00	30.06	− .03	71.0	− 0.2	96	18	79	48	24	63	32	63	81	3.47	− 1.1	9	5,644	ne.	40	nw.	19	14	6	10	4.6	100	1895	40	1888
S. Atlantic States.						75.1	+ 1.3										2.84	− 2.5														
Charlotte	773	18	29.24	30.04	− .05	72.6	+ 2.2	99	18	83	47	24	62	27	59	72	4.69	+ 1.3	7	3,995	ne.	26	sw.	16	19	10	1	3.0	99	1896	38	1888
Hatteras	11	16	30.05	30.06	− .01	73.8	+ 0.3	85	18	79	57	24	69	14	67	81	3.75	− 2.7	7	8,331	ne.	51	n.	23	16	7	7	4.3	90	*	50	1888
Kittyhawk	9	21	30.04	30.05	.00	72.0	− 1.2	93	18	77	51	24	67	19	66	84	3.63	− 1.0	7	10,409	ne.	58	ne.	23	12	11	7	4.2	97	1888	39	1888
Raleigh	398	10	29.65	30.06	− .05	71.8	+ 1.6	98	18	82	43	24	62	30	60	74	3.78	+ 0.1	8	3,509	n.	27	nw.	19	14	10	6	4.0	98	*	39	1888
Wilmington	78	26	29.98	30.06	− .01	74.2	+ 1.0	94	18	83	45	24	65	26	65	80	3.10	− 3.3	7	5,480	ne.	42	sw.	29	21	6	3	3.0	96	1895	42	1887
Charleston	52	26	30.02	30.07	+ .01	77.4	+ 2.0	94	17	84	59	24	71	20	68	79	2.75	− 3.8	4	5,882	ne.	62	s.	29	14	14	2	3.8	95	1894	49	1887
Columbia	......	10	......	......	......	76.4	+ 2.6	104	18	89	42	24	64	38	......	......	0.74	− 3.3	4	......	ne.	....	......	...	18	8	4	....	104	1896	42	*
Augusta	180	25	29.85	30.04	− .01	76.6	+ 1.2	101	18	88	43	24	65	36	62	70	1.71	− 2.2	5	3,636	se.	30	n.	29	17	10	3	3.4	101	1896	41	1888
Savannah	98	26	29.94	30.05	− .01	77.4	+ 1.9	97	17	86	53	24	68	26	69	82	2.08	− 4.0	6	4,879	e.	70	se.	29	23	5	2	2.8	97	*	48	1888
Jacksonville	43	25	29.97	30.02	− .01	79.2	+ 1.5	96	17	88	58	30	71	25	70	80	2.19	− 6.2	11	4,900	ne.	70	se.	29	14	12	4	4.2	97	1876	55	*
Florida Peninsula.						80.7	+ 0.3										5.72	− 1.8														
Jupiter	28	9	29.95	29.98	− .03	80.6	+ 0.6	90	29	86	71	11	76	15	73	81	5.65	− 4.1	14	6,878	ne.	33	ne.	23	2	21	7	6.3	91	1892	67	1888
Key West	22	26	29.96	29.98	− .01	82.0	0.0	90	2	86	71	19	78	14	74	77	4.22	− 3.2	15	6,983	ne.	33	ne.	26	4	14	12	6.6	97	1886	69	1893
Tampa	36	6	29.96	30.00	− .02	79.6	+ 0.3	94	17	88	62	24	71	22	71	82	7.30	+ 1.9	14	4,290	ne.	38	sw.	29	10	17	3	4.1	94	*	62	1896
East Gulf States.						77.6	+ 1.2										3.27	− 1.2														
Atlanta	1,131	18	28.88	30.04	− .06	74.7	+ 3.2	97	18	85	47	30	64	29	63	62	1.36	− 2.6	2	5,996	e.	32	nw.	22	17	9	4	3.5	97	1896	43	1888
Pensacola	56	17	29.95	30.01	− .02	78.1	+ 0.6	92	6	86	54	30	71	24	67	72	1.63	− 3.2	4	6,135	ne.	27	nw.	28	21	4	5	3.3	94	*	54	*
Mobile	57	26	29.98	30.04	+ .01	77.2	+ 0.3	92	20	86	49	30	68	28	66	77	2.52	− 2.6	5	4,507	n.	26	ne.	29	16	7	7	4.0	96	1881	49	1896
Montgomery	221	25	29.79	30.02	− .03	78.0	+ 2.5	98	17	90	50	30	66	32	63	66	1.16	− 1.8	3	3,934	sw.	23	nw.	22	22	7	1	2.5	99	1887	46	1888
Vicksburg	254	26	29.73	30.00	− .05	76.8	+ 1.1	96	15	88	42	29	66	31	61	67	0.26	− 3.2	6	4,294	se.	20	e.	12	25	2	3	2.8	98	1881	42	1896
New Orleans	54	26	29.96	30.02	+ .01	78.9	+ 0.7	91	17	86	56	29	72	20	69	79	5.26	+ 0.7	6	5,425	se.	30	n.	25	15	11	4	3.9	95	1893	56	*
Port Eads	......	10	......	......	......	79.7	− 0.1	88	13	85	60	*	74	21	......	......	10.09	+ 4.5	12	......	ne.	38	ne.	23	2	19	9	6.1	....	....	....	....
West Gulf States.						77.7	+ 1.7										3.95	0.0														
Shreveport	249	26	29.73	29.99	− .05	78.0	+ 1.6	99	16	89	41	29	67	34	63	67	3.59	− 0.1	7	4,382	se.	30	se.	25	19	5	6	3.3	101	1881	45	1896
Fort Smith	481	15	29.49	29.98	− .04	75.0	+ 2.6	102	17	87	41	29	63	38	58	65	2.72	− 0.8	6	4,605	e.	22	se.	8	18	5	7	3.5	102	1896	37	1895
Little Rock	302	18	29.71	30.03	− .03	73.8	+ 0.4	100	17	84	41	29	63	33	59	68	3.85	+ 0.7	8	4,213	se.	34	ne.	3	16	6	8	3.9	100	1896	41	1896
Corpus Christi	20	10	29.95	29.97	− .04	78.7	+ 0.2	89	5	84	58	29	73	21	73	83	4.39	− 0.4	13	8,427	se.	31	nw.	27	13	11	6	4.5	95	1893	55	1890
Galveston	42	26	29.96	30.00	.00	80.2	+ 1.5	90	4	85	61	28	76	16	71	76	2.20	− 4.0	10	7,363	se.	34	ne.	23	15	10	5	3.7	94	*	56	1890
Palestine	510	15	29.46	30.00	− .05	79.2	+ 3.8	104	5	91	47	29	67	39	63	67	2.01	− 1.2	5	4,470	se.	25	s.	26	14	11	5	4.3	104	1896	47	*
San Antonio	704	18	29.25	29.98	− .05	78.7	+ 2.0	100	5	89	47	29	68	32	66	74	8.87	+ 5.5	11	5,543	se.	33	nw.	4	10	15	5	4.5	103	1893	46	1890
Ohio Val. & Tenn.						68.1	+ 0.2										4.13	+ 1.2														
Chattanooga	762	18	29.27	30.06	− .03	73.1	+ 1.9	98	18	85	43	24	61	33	57	65	2.01	− 1.8	8	4,016	ne.	34	ne.	11	17	10	3	3.7	98	1896	35	1888
Knoxville	980	26	29.04	30.06	− .04	71.2	+ 1.3	96	18	83	42	24	60	33	59	71	2.02	− 0.7	6	3,426	w.	29	w.	30	15	11	4	3.4	97	1881	35	1888
Memphis	399	26	29.62	30.04	− .03	72.7	+ 0.3	96	17	83	41	29	63	32	58	66	3.21	+ 0.1	5	6,052	n.	38	nw.	5	17	6	7	3.9	99	1887	41	1896
Nashville	545	26	29.47	30.04	− .02	71.7	+ 1.3	99	17	83	40	24	60	37	56	65	2.74	− 1.3	8	4,378	nw.	30	nw.	12	18	6	6	3.6	99	*	38	1888
Lexington	980	12	28.99	30.03	− .03	67.4	− 0.3	95	18	78	36	23	57	35	55	70	4.25	+ 1.8	9	7,196	ne.	56	sw.	30	6	10	14	6.5	95	*	35	1888
Louisville	525	25	29.48	30.04	− .04	68.8	− 0.6	97	11	80	40	23	58	38	55	70	4.12	+ 1.3	11	4,986	s.	36	sw.	30	11	7	12	5.2	99	1881	36	1888
Indianapolis	823	26	29.18	30.04	− .03	64.2	− 1.0	92	12	73	37	23	55	29	53	73	8.17	+ 5.2	13	6,373	ne.	35	sw.	30	6	14	10	5.8	95	1894	34	1888
Cincinnati	628	26	29.38	30.05	− .02	65.5	− 2.7	93	11	75	38	23	56	36	54	70	5.00	+ 2.6	10	4,635	e.	34	nw.	19	11	10	9	5.1	95	*	35	1883
Columbus	824	19	29.17	30.04	− .02	63.2	− 2.0	94	11	74	36	23	53	33	55	79	5.98	+ 3.3	10	4,074	e.	26	nw.	19	4	11	15	6.8	98	1881	32	1888
Pittsburg	842	26	29.16	30.05	− .03	65.2	− 1.0	92	11	75	39	23	56	33	57	78	4.17	+ 1.6	10	3,524	sw.	24	sw.	30	14	11	5	4.1	102	1881	35	*
Parkersburg	638	9	29.39	30.07	− .05	65.9	+ 0.1	92	11	77	36	24	55	35	57	81	3.86	+ 0.7	12	3,390	se.	30	w.	5	11	7	12	5.4	96	*	33	1888
Lower Lake Region.						60.6	− 1.8										4.03	+ 1.1														
Buffalo	768	26	29.21	30.02	− .03	60.2	− 0.9	81	11	68	35	23	52	23	51	71	4.39	+ 1.1	13	9,559	sw.	57	w.	19	11	8	11	5.8	88	1884	35	*
Oswego	335	26	29.65	30.02	− .04	59.6	− 1.1	90	11	67	41	23	52	28	50	74	4.05	+ 1.2	13	6,802	s.	42	se.	30	10	6	14	5.7	93	1881	36	1890
Rochester	523	25	29.47	30.03	− .02	59.8	− 1.4	92	11	69	34	23	51	31	50	73	3.50	+ 1.2	11	4,797	sw.	34	sw.	30	8	11	11	5.8	98	1881	34	*
Erie	714	24	29.27	30.03	− .03	61.0	− 1.9	87	11	67	42	23	55	23	52	75	3.72	− 0.2	12	7,583	sw.	38	se.	29	6	14	10	5.9	92	*	36	1894
Cleveland	740	26	29.24	30.03	− .04	61.6	− 1.3	88	11	69	44	21	54	27	54	80	3.72	+ 0.2	14	8,557	se.	54	w.	19	8	8	14	6.1	98	1881	36	1887
Sandusky	629	20	29.35	30.02	− .04	62.2	− 2.0	90	11	69	41	23	55	28	53	75	4.52	+ 1.7	10	6,050	sw.	42	nw.	19	8	7	15	6.5	96	1881	38	1893
Toledo	674	26	29.31	30.02	− .03	60.5	− 2.7	88	10	69	35	23	52	27	52	79	4.09	+ 1.7	13	6,583	sw.	31	sw.	30	8	11	11	6.0	95	1881	34	1893
Detroit	730	26	29.24	30.02	− .04	59.6	− 2.8	84	*	68	33	23	52	25	51	78	4.23	+ 1.8	12	6,429	sw.	30	w.	19	6	18	6	5.2	97	1874	30	1883
Upper Lake Region.						56.2	− 2.4										4.35	+ 0.9														
Alpena	609	25	29.36	30.02	+ .01	53.4	− 2.8	75	10	61	28	23	46	35	48	84	6.00	+ 2.2	17	6,807	nw.	40	nw.	19	8	11	11	6.2	93	1884	28	*
Grand Haven	628	26	29.33	30.01	− .02	57.6	− 1.8	84	10	66	32	23	50	29	50	80	5.95	+ 2.4	19	6,586	nw.	38	nw.	19	6	14	10	6.3	88	*	30	1889
Marquette	734	26	29.18	29.97	− .02	54.4	− 1.0	79	8	62	35	22	47	37	46	78	1.34	− 2.5	8	8,473	nw.	43	s.	7	3	10	17	7.2	97	1874	28	1883
Port Huron	639	23	29.35	30.04	.00	58.6	− 1.6	86	11	67	32	23	51	27	51	82	4.74	+ 2.1	14	7,726	s.	40	nw.	19	8	14	8	5.4	94	1895	31	1879
Sault Ste. Marie	624	9	29.32	29.99	− .02	51.6	− 4.4	72	8	59	29	23	44	32	46	86	2.48	− 2.0	11	6,284	nw.	36	nw.	19	3	16	11	6.6	88	1892	29	1896
Chicago	824	26	29.15	30.03	− .01	60.6	− 2.9	88	10	67	40	23	54	25	50	72	6.70	+ 3.9	13	11,878	ne.	42	n.	30	9	13	8	5.5	95	1893	35	1889
Milwaukee	673	26	29.31	30.03	− .01	58.2	− 2.8	86	2	66	38	22	51	28	51	82	5.72	+ 2.9	18	6,987	n.	31	nw.	19	3	13	14	7.2	94	*	34	*
Greenbay	617	11	29.37	30.04	.00	56.4	− 3.3	84	9	65	34	22	48	29	47	79	5.21	+ 2.1	15	6,362	s.	26	nw.	19	7	11	12	6.2	95	1895	30	1893
Duluth	702	26	29.22	29.98	.00	54.6	− 0.8	78	7	62	34	19	47	32	44	73	1.00	− 2.9	11	7,500	sw.	38	ne.	12	9	15	6	4.6	94	1894	30	1893
North Dakota.						53.7	− 2.4										1.78	+ 0.4														
Moorhead	935	16	28.97	29.99	+ .03	53.8	− 1.9	95	7	66	27	19	42	42	42	73	3.02	+ 0.9	13	7,597	n.	34	se.	12	11	10	9	5.2	98	1894	17	1883
Bismarck	1,674	22	28.24	30.01	+ .06	54.4	− 2.2	93	7	68	22	19	41	46	40	67	1.42	+ 0.3	11	6,574	nw.	36	nw.	24	14	9	7	4.4	96	*	10	1876
Williston	1,875	18	28.01	29.99	+ .04	52.8	− 3.1	90	6	65	26	19	40	43	39	67	0.89	+ 0.1	8	5,594	nw.	36	nw.	4	9	13	8	5.1	100	1892	17	1895
Upper Miss. Valley.						61.4	− 2.9										4.13	+ 0.9														
Minneapolis	......	7	......	......	......	57.8	− 4.5	82	7	68	34	*	48	31	......	......	2.58	+ 0.4	9	......	s.	....	......	...	7	13	10	....	96	1895	32	1893
St. Paul	850	26	29.11	30.02	+ .03	56.5	− 3.2	81	7	66	32	20	47	34	45	71	2.45	− 0.6	8	5,287	se.	29	sw.	24	7	12	11	6.0	96	1895	30	1889
La Crosse	......	24	......	......	......	55.5	− 4.9	82	9	66	33	27	45	33	......	......	3.33	− 0.9	11	4,544	s.	28	nw.	19	9	8	13	6.1	97	1895	29	1888
Davenport	613	25	29.37	30.02	− .02	60.6	− 3.6	89	2	70	36	20	52	31	50	77	3.98	+ 0.8	18	6,213	e.	36	sw.	5	6	11	13	5.9	96	1893	33	1889
Des Moines	867	19	29.13	30.06	+ .05	59.6	− 3.8	83	8	68	32	28	51	37	50	77	3.61	+ 0.4	13	4,833	ne.	27	s.	4	12	6	12	5.2	95	1893	31	1880
Dubuque	650	24	29.33	30.03	.00	59.6	− 2.8	86	*	69	33	28	50	33	50	78	5.67	+ 1.6	16	3,122	n.	18	sw.	24	7	11	12	6.1	97	1895	31	*
Keokuk	614	26	29.38	30.03	.00	62.5	− 2.9	92	2	71	39	20	54	33	52	78	9.44	+ 5.9	19	5,105	n.	45	nw.	2	9	7	14	6.0	97	*	33	1889
Cairo	359	26	29.64	30.02	− .03	69.4	− 0.3	97	17	78	44	23	60	30	59	76	2.95	+ 0.4	7	5,290	s.	45	w.	4	8	16	6	5.1	97	*	42	1888
Springfield, Ill	644	18	29.35	30.03	− .03	64.1	− 1.6	91	10	73	39	23	55	32	58	76	5.42	+ 2.2	15	6,309	s.	36	w.	26	8	10	12	6.0	98	1893	36	*
Hannibal	584	....	29.47	30.04	......	63.2	......	94	2	72	36	23	54	32	58	76	3.54	+ 0.5	15	6,134	n.	34	n.	16	10	8	12	5.7	....	....	....	....

TABLE I.—*Climatological data for Weather Bureau Stations, September, 1896*—Continued.

Stations.	Elevation above sea-level, feet.	Length of record, years.	Pressure, in inches. Mean pressure, 8 a.m. and 8 p.m. ÷ 2.	Mean reduced.	Departure from normal.	Temperature of the air, in degrees Fahrenheit. Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Humidity and precipitation. Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal.	Days with .01, or more.	Wind. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Monthly temperature data since opening station. Absolute maximum.	Year	Absolute minimum.	Year
Up. Miss. Val.—Con																																
St. Louis	567	26	29.44	30.05	.00	68.2	− 1.0	95	13	77	45	*	59	31	58	77	2.42	− 0.7	12	7,029	s.	31	ne.	16	8	15	7	5.4	102	1881	40	1873
Missouri Valley.						62.6	− 2.6										2.92	+ 0.4														
Columbia	......	8	......	......	......	66.8	− 1.2	97	13	79	33	23	55	39	......	......	3.61	− 0.0	15	5,628	nw.	42	nw.	16	6	10	14	6.4	104	1893	26	1895
Kansas City	963	9	29.03	30.05	+ .03	64.8	− 2.6	94	16	74	42	20	56	31	55	78	2.81	− 0.6	11	5,713	ne.	29	ne.	19	8	13	9	5.3	101	1893	37	1895
Springfield, Mo	1,324	10	28.64	30.02	− .01	66.8	− 0.9	92	16	76	40	29	57	31	55	74	4.12	− 0.0	13	6,917	se.	30	n.	4	11	13	6	4.5	102	1893	37	1895
Topeka	......	10	......	......	......	65.4	− 1.5	96	16	77	36	28	54	41			2.61	− 0.1	10	......	n.	......	......		8	10	12	....	104	1893	33	*
Omaha	1,123	26	28.87	30.05	+ .02	61.6	− 2.8	88	8	71	37	19	52	32	51	75	3.97	+ 1.1	7	5,133	n.	28	s.	24	13	8	9	4.8	102	1893	30	1873
Sioux City	1,165	8	......	......	......	58.5	− 6.2	86	8	70	32	19	46	39			2.09	+ 1.0	8	7,080	nw.	37	s.	1	14	7	9	4.9	108	1895	27	1895
Pierre	1,470	22	28.43	29.98	− .01	59.6	− 2.6	98	7	72	28	19	48	45	44	65	1.76	+ 0.8	6	6,080	n.	32	s.	12	10	11	9	5.1	107	1874	18	1881
Huron	1,310	16	28.62	30.02	+ .02	57.2	− 1.9	95	7	71	24	19	43	44	44	68	2.36	+ 1.0	9	9,750	se.	46	se.	23	13	9	8	4.7	103	1895	18	1893
Northern Slope.						55.0	− 3.2										1.77	+ 0.8														
Havre	2,477	17	27.39	29.99	+ .03	52.4	− 2.2	88	6	65	28	19	40	49	39	69	1.63	+ 0.4	10	5,499	sw.	38	n.	24	13	5	12	5.1	93	*	18	1895
Miles City	2,372	19	27.50	29.97	− .01	55.2	− 4.8	90	7	68	28	19	42	50	38	58	0.66	− 0.1	10	4,542	nw.	38	nw.	24	16	3	11	4.6	99	*	22	1895
Helena	4,108	17	25.90	30.08	+ .09	51.8	− 4.8	85	6	62	32	10	42	35	37	63	2.54	+ 1.4	10	4,557	sw.	30	sw.	24	14	4	12	4.6	90	1893	26	*
Rapid City	3,260	11	26.65	30.00	+ .03	56.7	− 4.0	91	7	67	30	19	46	42	42	68	2.58	+ 2.0	16	6,349	s.	36	w.	24	8	8	14	6.5	100	1895	25	1893
Cheyenne	6,105	26	24.08	30.01	+ .04	55.0	− 1.7	83	1	67	19	27	43	37	40	67	2.08	+ 1.2	14	6,627	s.	37	nw.	7	12	8	10	5.5	90	1895	19	1896
Lander	5,372	15	24.70	30.04	+ .06	53.8	− 3.0	85	6	67	24	27	41	44	37	62	1.08	+ 0.4	10	2,566	sw.	28	w.	15	8	11	11	5.9	90	1882	7	1895
North Platte	2,836	22	27.13	30.04	+ .04	60.2	− 2.2	93	1	73	30	27	48	44	47	72	1.84	+ 0.6	8	6,357	se.	36	s.	23	9	18	3	4.6	101	1895	21	1876
Middle Slope.						65.9	− 0.8										2.17	+ 0.4														
Denver	5,290	25	24.79	30.00	+ .04	61.2	− 0.2	91	15	74	37	27	48	41	40	57	1.81	+ 1.0	8	5,077	s.	40	ne.	25	13	10	7	4.5	96	1895	27	1895
Pueblo	4,713	9	25.32	29.98	+ .03	63.5	− 0.2	94	1	77	33	28	50	43	43	59	1.41	+ 1.0	9	4,691	se.	37	n.	25	12	11	7	5.0	97	1889	28	1895
Concordia	1,398	12	28.55	30.02	− .02	64.4	− 2.5	97	8	76	35	28	53	43	51	72	3.53	+ 1.2	9	4,435	se.	23	se.	7	13	9	8	4.4	104	1895	29	1895
Dodge City	2,504	22	27.42	29.99	+ .02	66.2	− 1.2	101	8	79	38	29	53	43	48	65	1.06	− 0.3	8	7,460	se.	34	s.	2	15	9	6	4.2	101	1896	30	1895
Wichita	1,351	9	28.59	30.00	+ .01	68.3	− 0.7	98	16	80	36	28	56	41	53	68	3.08	+ 0.4	11	5,886	n.	28	s.	8	12	8	10	4.5	104	1893	34	1895
Oklahoma	1,239	6	28.73	30.01	+ .01	71.9	+ 0.3	100	7	84	37	28	60	37	56	67	2.14	− 0.8	7	6,040	s.	28	sw.	8	21	5	4	3.3	101	*	36	1895
Southern Slope.						......											3.30	+ 1.0														
Abilene	1,749	11	28.21	30.00	− .01	74.8	+ 0.9	99	7	85	42	28	64	30	56	63	4.14	+ 1.7	6	6,388	se.	34	sw.	8	11	8	11	4.9	104	1893	42	1896
Amarillo	3,691	5	26.30	30.00	.00	66.4		95	7	78	38	28	55	35	50	65	2.45	+ 0.3	8	10,794	s.	48	n.	19	11	8	11	5.0	95	*	38	*
Southern Plateau.						75.6	+ 0.1										1.09	+ 0.3														
El Paso	3,767	19	26.19	29.92	− .01	74.1	+ 0.7	94	2	86	50	25	62	40	51	53	1.48	+ 0.4	6	7,163	e.	48	ne.	19	11	13	6	4.6	104	1879	42	*
Santa Fe	6,998	23	23.36	29.98	− .01	61.2	+ 1.5	84	16	72	34	28	50	31	40	56	1.39	− 0.1	12	4,449	se.	25	e.	4	15	11	4	4.0	90	1879	27	1880
Phœnix	1,106	....	28.67	29.80	......	82.9	+ 2.1	104	4	96	55	24	70	38	57	47	1.18	+ 0.6	3	3,170	w.	23	se.	20	21	3	6	2.8	....	....	....	....
Yuma	139	21	29.62	29.76	− .05	84.0	− 0.2	108	15	99	55	24	69	40	57	48	0.31	+ 0.2	2	3,704	sw.	33	s.	8	26	4	0	1.2	113	1879	50	*
Middle Plateau.						60.3	− 1.0										0.52	0.0														
Carson City	4,720	9	25.27	29.97	......	57.8	− 2.4	86	4	74	32	28	41	45	36	55	0.38	+ 0.1	2	......	sw.	....	......	...	18	9	3	3.0	89	1888	18	1895
Winnemucca	4,340	18	25.64	29.93	− .02	59.2	− 0.6	90	5	74	30	10	45	46	24	31	0.67	+ 0.3	3	6,519	sw.	48	ne.	19	18	6	6	3.3	94	*	16	1895
Salt Lake City	4,344	23	25.62	29.94	− .02	64.0	+ 0.1	90	5	76	36	27	52	33	40	44	0.52	− 0.4	8	5,002	se.	44	e.	19	13	12	5	4.8	93	1875	29	1895
Northern Plateau.						58.4	− 0.6										0.27	− 0.6														
Baker City	3,470	8	26.45	29.94	.00	55.8	− 0.6	88	6	70	29	26	41	40	33	50	0.20	− 0.6	3	3,852	s.	22	w.	7	21	4	5	2.8	93	1893	28	1891
Idaho Falls	4,742	7	25.25	29.97	− .02	56.8	+ 0.5	86	5	73	24	27	41	45	35	53	0.30	− 0.5	6	5,731	s.	37	sw.	8	16	7	7	4.0	88	1892	19	1895
Spokane	1,930	16	27.99	30.01	+ .03	58.4	+ 0.5	87	6	71	35	26	46	44	38	55	0.42	− 0.6	5	2,939	ne.	27	sw.	23	14	8	8	4.5	98	1888	26	1889
Walla Walla	1,018	11	28.92	29.99	− .01	62.6	− 2.7	92	6	74	40	9	51	38	46	57	0.17	− 0.8	3	3,686	sw.	30	ne.	18	18	12	0	3.2	100	1888	36	*
N. Pac. Coast Reg.						57.2	− 0.7										1.21	− 2.0														
Fort Canby	179	14	29.82	30.02	+ .01	57.2	− 0.7	89	4	63	47	14	51	34	51	87	1.75	− 2.0	5	6,085	n.	52	s.	30	9	8	13	5.7	89	1896	42	1884
Port Angeles	29	12	......	......	......	52.6	− 0.1	78	19	60	36	26	45	35	......	......	0.91	− 0.9	4	2,992	w.	23	w.	10	19	3	8	3.2	78	1896	32	*
Seattle	119	....	29.90	30.04	......	56.7	......	82	4	64	42	14	49	29	50	78	1.78	......	3	2,240	se.	15	se.	23	11	9	10	5.1	....	....	....	
Tatoosh Island	86	13	29.95	30.05	+ .05	52.0	− 2.3	68	4	56	42	18	48	16	47	85	0.82	− 5.7	4	5,695	ne.	36	e.	27	10	6	14	6.0	71	1889	30	1890
Astoria	......	12	......	......	......	59.5	− 0.4	84	4	67	45	17	52	24	......	......	2.62	− 1.7	9	......	sw.	....	......	...	16	4	10	....	87	1889	40	1895
Portland, Oreg	153	25	29.84	30.02	− .01	61.0	− 0.5	89	4	71	42	25	51	30	49	69	0.47	− 1.3	5	5,567	nw.	26	s.	30	14	11	5	3.5	93	1886	36	1895
Roseburg	521	19	29.42	29.98	− .06	60.6	− 0.1	91	5	74	37	*	47	48	46	67	0.67	− 0.4	3	2,059	nw.	20	n.	7	21	7	2	2.3	99	1888	35	*
Mid. Pac. C'st Reg.						62.3	− 1.0										0.70	0.0														
Eureka	64	10	29.92	29.98	− .02	55.6	+ 1.2	68	10	62	43	13	49	21	51	90	1.60	+ 0.4	4	3,195	nw.	30	nw.	18	6	17	7	5.6	77	1889	36	1895
Redbluff	334	19	29.53	29.87	− .04	72.8	− 0.4	100	5	85	51	14	60	34	45	43	0.63	0.0	4	3,981	nw.	24	nw.	18	22	4	4	2.3	107	1891	46	1884
Sacramento	71	20	29.80	29.88	− .06	68.0	− 1.9	94	3	81	47	13	55	35	52	64	0.31	0.0	3	5,265	sw.	24	sw.	22	21	7	2	2.9	106	1888	44	1893
San Francisco	153	26	29.78	29.94	− .01	59.6	− 2.1	81	26	65	52	11	54	27	53	84	0.52	+ 0.2	5	7,825	w.	33	sw.	3	14	11	5	4.4	94	1886	49	1894
Point Reyes Light	......	7	......	......	......	55.7	− 1.7	70	26	60	49	*	52	20	......	......	0.43	− 0.4	2	......	nw.	....	......	...	9	4	17	....	....	....	....	....
S. Pac. Coast Reg.						69.0	− 2.1										0.02	− 0.1														
Fresno	332	10	29.50	29.84	− .04	72.6	− 3.0	101	6	88	50	23	57	38	46	46	0.06	− 0.1	1	3,768	nw.	19	nw.	22	25	4	1	1.8	111	1888	44	1895
Los Angeles	330	20	29.54	29.89	− .02	67.6	− 2.1	92	16	79	50	14	56	36	56	76	T.	− 0.1	0	2,916	w.	15	w.	7	8	22	0	3.9	108	1885	44	1880
San Diego	69	25	29.83	29.91	− .01	66.7	− 1.1	80	16	73	54	20	60	21	59	78	T.	− 0.1	0	3,502	nw.	18	nw.	16	27	1	2	2.1	100	1878	50	*
San Luis Obispo	201	....	29.73	29.95	......	64.3	......	95	25	77	44	14	51	45	51	72	T.	......	0	3,264	w.	18	n.	15	10	11	9	4.7	....	....	....	....

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote number of days missing from the record. * Two or more directions, dates, or years.

TABLE II.—*Meteorological record of voluntary and other cooperating observers, September, 1896.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. Minimum.	Temperature. Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Aloo†	94	41	75.9	0.86	
Ashville*†[1]	104	42	75.1	1.80	
Bermuda†[1]	94	41	75.3	0.44	
Birmingham†	100	46	77.2	0.68	
Brewton†	98	38	74.4	1.40	
Carrollton*†[1]	93	49	75.3	2.31	
Citronelle†	90	53	77.0	3.27	
Clanton†	96	43	76.0	0.62	
Cordova†	......	......	......	1.92	
Daphne†	92	43	76.1	2.04	
Decatur†	99	38	72.1	3.94	
Demopolis†	......	......	......	2.42	
Elba†	98	41	77.2	1.98	
Eufaula *a*†	100	51	80.1	1.99	
Evergreen†	94	40	76.0	1.41	
Florence *a*†	......	......	......	1.78	
Florence *b*†	97	44	72.9	1.78	
Fort Deposit†	98	40	78.0	0.17	
Goodwater†	101	45	78.2	3.05	
Greensboro†	98	48	76.8	0.35	
Hamilton†	......	......	......	1.71	
Healing Springs†	95	35	73.2	1.79	
Highland Home†	96	52	78.4	0.50	
Livingston†	99	44	76.4	1.25	
Lock No. 4	......	......	......	1.04	
Madison Station†	100	41	72.7	3.71	
Marion†	94	48	77.6	0.92	
Mount Willing†	98	44	77.9	0.74	
Newbern†	96	45	77.9	0.63	
Newburg†	102[e]	43[e]	75.9[e]	2.83	
Newton†	97	47	76.9	3.80	
Oneonta†	99	38	73.8	1.09	
Opelika†	98	48	77.0	1.94	
Ozanna†	98	44	75.4	2.49	
Pineapple†	100	35	75.3	0.00	
Pushmataha†	97	46	76.4	1.84	
Rockmills†	95	46	75.7	3.95	
Scottsboro†	99	43	72.6	3.19	
Selma†	......	......	......	0.42	
Talladega*[1]	97	48	75.5	......	
Thomasville†	97	62	79.2	0.40	
Tuscaloosa†	101	45	76.8	0.62	
Tuscumbia†	99	42	73.5	1.76	
Union†	102	42	78.6	0.76	
Union Springs†	96	46	77.6	1.10	
Uniontown†	96	50	78.8	0.83	
Valleyhead†	97	39	73.7	1.95	
Wetumpka	......	......	......	1.62	
Wilsonville†	......	......	......	2.32	
Alaska.					
Killisnoo	64	35	45.4	8.95	
Arizona.					
Benson*[5]	100	59	75.9	4.45	
Bisbee†	91	54	71.7	2.35	
Buckeye†	105	55	82.6	1.00	
Calabasas†	96	36	73.6	3.89	
Casa Grande*[5]	107	63	85.4	1.15	
Dragoon†	......	......	......	4.33	
Dragoon Summit*[5]	95	57	77.6	3.11	
Dudleyville†	98	50	75.8	2.03	
Eagle Pass*[3]	......	......	67.0	1.77	
Farleys Camp†	102	61	80.7	1.15	
Fort Apache	90	36	67.2	1.34	
Fort Grant†	94	50	72.4	2.91	
Fort Huachuca†	92	46	70.0	3.70	
Gilabend *a**[5]	106	65	86.4	1.06	
Glendale	103	52	80.8	......	
Holbrook†	92	40	66.6	1.33	
Ingleside	106	54	84.4	0.70	
Lochiel*†[1]	90	48	69.1	2.72	
Maricopa*[5]	112	63	86.0	0.30	
Mesa†	104	57	81.2	0.37	
Oracle†	94	53	73.3	2.39	
Oro	......	......	......	1.52	
Oro Blanco	94	56	77.0	1.88	
Pantano*[5]	96	65	78.2	1.81	
Parker†	112	50	83.8	......	
Payson	......	......	......	2.68	
Peoria†	103	58	82.6	0.50	
Phœnix	102	52	81.0	0.45	
Pinal Ranch	......	......	......	3.47	
Reymert†	110	57	84.9	1.68	
St. Helena Ranch†	92	55	73.3	4.42	
San Carlos†	106	50	78.8	2.67	
San Simon*[5]	102	58	77.8	0.00	
Signal†	104	54	81.0	0.43	
Sulphur Spring Valley†	......	......	......	4.62	
Texas Hill*[5]	112	65	87.4	1.17	
Tucson *c*†	102	52	80.6	1.13	
Walnut Grove†	......	......	......	0.38	
Walnut Ranch*†[1]	86	48	68.4	4.17	
Whipple Barracks†	92	35	65.4	1.24	
Willcox*[5]	93	56	74.3	1.35	
Arkansas.					
Amity*[5]	100	41	74.8	2.54	
Arkansas City†	......	......	......	1.01	

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. Minimum.	Temperature. Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Arkansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Beebranch†	104[e]	37[e]	72.8[e]	2.90	
Blanchard Springs†	99	40	76.0	3.02	
Brinkley†	100	35	73.0	3.49	
Camden *a*†	......	......	......	3.35	
Camden *b*†	103	38	74.8	3.49	
Canton*[6]	102	42	70.7	......	
Conway*[6]	99	44	73.7	2.41	
Corning†	98	35	68.1	4.28	
Dallas†	......	......	......	3.97	
Dardanelle†	......	......	......	3.18	
Elon†	103	37	76.0	2.20	
Emmet*[1][e]	102	45	76.0	......	
Fayetteville†	97	38	71.8	3.95	
Forrest†	101	37	73.4	3.23	
Fulton†	......	......	......	2.84	
Gaines Landing†	......	......	......	0.69	
Helena *a*†	......	......	......	2.31	
Helena *b*†	103	40	75.4	3.06	
Hot Springs *a*	105	41	76.6	4.40	
Hot Springs *b*	......	......	......	3.50	
Hot Springs (near)	......	......	......	3.87	
Jonesboro†	102	37	71.2	3.45	
Keesees Ferry†	101	35	70.6	3.44	
Lacrosse†	101	35	69.4	2.73	
Lonoke*[1]	100	43	74.5	3.43	
Luna Landing*[6]	95	40	75.7	0.99	
Lutherville*[1]	101	43	76.0	......	
Malvern†	106	39	73.9	2.36	
Marianna*[1]	98	46	73.4	......	
Marvell	101	42	74.8	4.53	
Moore	......	......	......	5.07	
Mossville	94	45	69.8	4.24	
Mount Nebo†	90	48	70.2	4.37	
New Gascony*[1]	94	42	73.9	4.06	
Newport *a*†	......	......	......	4.99	
Newport *b*†	99	37	70.7	4.80	
Newport *c*†	103	36	71.6	4.07	
Osceola†	99	39	70.6	2.72	
Ozark†	102	41	76.5	2.11	
Picayune†	101	......	......	2.82	
Pinebluff†	104	40	75.7	4.94	
Pocahontas†	96	40	68.4	4.46	
Prescott†	106	42	79.4	2.40	
Rison†	98	40	73.7	3.60	
Russellville†	100	40	72.6	3.40	
Silver Springs†	95	36	68.9	3.41	
Stuttgart†	101	37	73.8	3.06	
Texarkana†	104	41	79.2	2.48	
Warren†	102	40	75.9	3.35	
Washington†	101	......	......	2.67	
Wiggs*[1]	105	46	77.6	2.98	
Winslow	......	......	......	3.37	
Witts Springs†	95	35	68.8	4.49	
California.					
Adin	94	28	58.0	1.15	
Arlington Heights	102	43	71.1	0.00	
Asti	96	52	68.4	0.00	
Athlone*[5]	98	52	70.4	T.	
Azusa	......	......	......	T.	
Ballast Point L. H	......	......	......	0.00	
Barstow†	98	41	70.0	0.00	
Bear Valley†	......	......	......	2.18	
Berkeley	78	51	61.2	0.76	
Bishop†	93	32	62.2	T.	
Boca*[5]	84	28	53.0	0.35	
Bodie†	77	18	46.0	1.00	12.0
Bowmans Dam†*[1]	87[d]	40	58.7[d]	2.05	0.5
Caliente*[5]	96	53	74.0	0.00	
Calloway Canal†	......	......	......	0.10	
Cape Mendocino L. H	......	......	......	1.00	
Cedarville†	88	34	58.4	0.55	
Centerville*[1]	92	54	65.4	0.57	
Chico*[5]	105	52	71.6	0.76	
Cisco*[5]	77	36	52.5	......	
Claremont†	98	43	68.8	T.	
Coronado	88	56	70.2	T.	
Craftonville	112	48	75.7	0.00	
Crescent City†	76	38	55.3	1.17	
Crescent City L. H	......	......	......	1.27	
Davisville *b*	98	47	72.8	0.77	
Delano*[5]	97	53	72.4	0.00	
Descanso*[5]	94	32	63.4	0.03	
Drytown	94	41	65.3	T.	
Dunnigan*[5]	96	50	73.4	0.48	
Durham*[1]	94	48	65.4	0.86	
East Brother L. H	......	......	......	0.35	
Edgwood*[5]	87	40	56.0	0.71	
Edmanton*†[1]	87	40	55.8	1.43	
Escondido	98	40	70.0	......	
Fallbrook*[1]	98	50	66.0	0.00	
Famosa	97	56	75.5	......	
Folsom City *b**[1]	96	56	71.5	0.35	
Fordyce Dam†	......	......	......	1.84	3.0
Fort Bragg†	......	......	......	0.47	
Georgetown†	91	46	65.5	0.83	
Glendora	......	......	......	0.00	

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. Minimum.	Temperature. Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Goshen*[5]	102	46	69.6	0.00	
Grass Valley	......	......	......	1.53	
Greenville†	97	27	54.3	1.23	
Guinda	......	......	......	0.68	
Healdsburg*[1]	88	46	62.0	0.38	
Hollister	86	38	59.1	0.03	
Hueneme	......	......	......	0.00	
Humboldt L. H	......	......	......	1.80	
Hydesville†	76	40	57.2	0.91	
Indio*[5]	101	62	82.4	......	
Iowa Hill*[1]	92	48	65.1	1.00	
Isabella	100	40	69.2	0.32	
Jackson	86	42	60.2	0.23	
Jolon	......	......	......	0.03	
Keeler*[5]	94	60	77.4	0.50	
Keene*[5]	94	42	67.1	0.00	
Kennedy Gold Mine	94	44	67.0	0.29	
Kernville	......	......	......	0.00	
King City*[5]	88	46	63.6	0.00	
Kingsburg*[5]	98	55	74.3	0.13	
Kono Tayee	89	53	69.0	0.29	
Lagrange*[5]	100	53	74.1	T.	
Laporte*†[1]	84	41	54.0	2.29	
Lemoore *a**[5]	100	50	72.7	0.00	
Lick Observatory†	82	38	61.7	0.47	
Lime Kiln	105	49	73.8	......	
Lime Point L. H	......	......	......	0.51	
Lodi	91	45	67.2	0.04	
Los Alamos†	......	......	......	0.00	
Los Gatos *b*	86	48	62.7	0.39	
McMullin*[1]	102	50	76.0	......	
Malakoff Mine*[1]	88	48	63.4	1.90	
Mammoth Tank*[5]	110	63	87.4	T.	
Manzana	94	37	70.6	0.00	
Mare Island L. H.	......	......	......	0.84	
Merced*[5]	99	52	70.7	0.00	
Middletown*†[1]	96	42	65.9	0.48	
Mills College	......	......	......	0.80	
Milton (near)*[1]	96	53	72.0	0.04	
Modesto*[5]	100	57	70.6	0.25	
Mohave*[5]	98	50	74.1	0.00	
Mokelumne Hill*[3]	......	52	65.5	0.10	
Monterey*[5]	77	52	61.8	0.27	
Morena Dam*[1]	92	35	60.5	0.09	
Mount Glenwood*[1]	94	58	72.8	0.32	
Mt. Lowe Observatory	......	......	......	0.00	
Mutah Flat†	......	......	......	0.00	
Napa *b*	96	44	66.2	0.50	
Needles	......	51	......	0.00	
Nevada City†	89	40	61.4	1.55	
Newcastle *a*†	91	47	67.4	1.28	
Newhall*[5]	105	50	63.7	......	
Nordhoff†	99	40	64.2	0.00	
Ogilby*[5]	112	78	91.5	0.00	
Oleta*[1]	90	44	63.3	0.12	
Orangevale†	92	45	69.0	0.43	
Orland*[5]	104	54	73.6	0.83	
Oroville *b*	101	56	74.7	1.40	
Palermo†	100	44	69.3	1.17	
Paso Robles *b**[1]	92	48	67.2	T.	
Peachland*[1]	......	......	......	0.60	
Picacho†	107	65	88.8	T.	
Piedras Blancas L. H	......	......	......	0.24	
Pigeon Point L. H	......	......	......	0.20	
Pilot Creek	......	......	......	1.29	
Placerville	91	39	62.4	0.63	
Point Ano Nuevo L. H.	......	......	......	0.20	
Point Arena L. H	......	......	......	0.12	
Point Bonita L. H.	......	......	......	0.49	
Point Conception L. H	......	......	......	0.06	
Point Fermin L. H	......	......	......	0.00	
Point George L. H.	......	......	......	0.56	
Point Hueneme L. H.	......	......	......	0.00	
Point Lobos	69	50	57.4	0.46	
Point Loma L. H.	......	......	......	0.00	
Point Montara L. H.	......	......	......	0.41	
Point Pinos L. H.	......	......	......	0.23	
Point Reyes L. H.	......	......	......	0.43	
Point Sur L. H	......	......	......	0.00	
Poway*[3]	96	52	63.6	0.00	
Quincy†	89	30	59.3	1.43	
Ravenna*[5]	99	41	69.4	0.00	
Redding *b*†	98	49	71.9	0.81	
Reedley (near)*[1]	100	58	75.4	T.	
Represa	90	50	67.6	0.35	
Riovista	94	49	68.4	0.53	
Roe Island L. H.	......	......	......	0.30	
Roseville (near)*[1]	96	48	65.4	0.52	
Rosewood	99	43	68.2	1.08	
Sacramento *a*	92	47	67.2	0.46	
Salinas*[5]	75	52	62.0	0.00	
San Bernardino†	101	44	70.4	0.00	
San Jacinto†	102	42	70.0	0.40	
San Jose *b*	87	41	61.4	0.32	
San Leandro*[1]	88	57	64.2	0.89	
San Luis L. H.	......	......	......	0.00	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
San Mateo*[8]	82	55	64.4	0.52	
San Miguel*[8]	94	49	66.7	0.70	
Santa Ana*[5]	92	58	73.9	0.00	
Santa Barbara L. H.	......	......	......	0.00	
Santa Clara *a**[6]	84	48	61.6	0.19	
Santa Cruz *b*†	88	42	61.3	0.35	
Santa Cruz L. H.	......	......	......	0.30	
Santa Maria	85	44	64.5	0.02	
Santa Monica*[8]	89	57	70.0	......	
Santa Paula *b*†	92	43	63.9	0.00	
Santa Rosa*[8]	88	51	61.4	0.46	
Shasta	......	......	......	1.06	
Sneddens Ranch*†[1] *g*	84	20	50.8	......	
S. E. Farallone L. H	......	......	......	0.30	
Stanford University	87	46	62.7	0.30	
Stockton *a*	90	47	66.7	T.	
Summerdale†	80	32	58.4	1.28	
Susanville†	89	41	63.9	1.33	
Tecarte Dam*[4]	100	34	54.0	......	
Tehama*[8]	99	57	75.1	0.58	
Templeton*[8]	90	48	63.8	0.00	
Trinidad L. H	......	......	......	1.60	
Truckee*[8]	84	34	54.6	0.32	
Tulare *b*	......	......	......	T.	
Tulare *c*	108	46	73.6	0.03	
Turlock *b*†	101	42	68.2	T.	
Ukiah†	90	42	64.4	0.37	
Upper Lake	96	41	67.3	0.42	
Upper Mattole	......	......	......	0.74	
Vacaville *a**[1]	95	53	69.4	0.40	
Ventura†	84	43	60.6	0.00	
Volcano Springs*[8]	118	62	92.4	0.00	
Walnutcreek	91	52	69.4	0.40	
West Palmdale	......	......	......	0.32	
Westpoint†	......	......	......	0.35	
Wheatland†	92	45	68.0	1.12	
Williams*[8]	96	50	71.9	0.70	
Wilmington*[5]	80	60	68.5	0.00	
Wire Bridge*[5]	96	50	70.5	0.91	
Yerba Buena L. H	......	......	......	0.34	
Yreka†	93	35	60.6	0.52	
Yuba City*[5]	90	62	76.0	0.97	
Colorado.					
Alma†	68[e]	17	43.0[e]	2.19	......
Antlers†	90	33	61.0	4.09	
Arkins	......	......	......	2.60	
Boxelder	......	......	......	2.86	T.
Breckenridge†	74	9	46.4	2.25	2.0
Brush[j]	90	33	58.3	......	
Byers*[1]	91	29	52.2	......	
Canyon†	93	32	64.2	1.62	
Capps†	......	......	......	0.21	T.
Castlerock†	86	20	57.4	2.80	
Colorado Springs†	86	31	57.7	2.58	0.4
Cope†	93	35	62.4	0.50	
Craig	......	......	......	3.02	
Cripple Creek	88	24	55.6	2.15	1.2
Crook	96	29	61.2	1.72	T.
Deertrail*[5]	87	38	62.6	0.30	
Delta†	94	30	60.6	2.13	
Downing†	85	34	62.0	3.21	
Dumont*†[5]	88	32	56.2	2.04	
Durango†	82	34	59.4	3.59	
First View*[6]	92	......	59.8	0.91	
Fleming	......	......	......	1.32	
Fort Collins†	90	32	58.8	1.55	
Fox	......	......	......	0.96	
Garnett	......	......	......	0.39	
Gleneyrie†	79	31	56.8	2.88	
Goldhill*[1]	85	26	55.0	2.65	2.0
Grand Junction†	88	40	66.0	3.78	
Greeley†	87	29	58.2	0.99	
Gulch†	82	26	55.4	3.16	
Gunnison†	83	16	51.8	0.99	
Holly	......	......	......	1.47	
Holyoke *a*	......	......	......	0.96	
Hugo (near)	84	30	57.0	0.65	
Husted†	80	27	59.0	2.59	0.5
Kit Carson*[1]	89	40	64.2	......	
La Jara†	87	19	56.2	0.15	
Lake Moraine†	71	18	47.0	1.70	4.0
Lamar†	104	36	67.3	2.53	
Laporte	......	......	......	1.27	
Las Animas†	99	40	65.0	2.45	
Lay†	88[e]	26[e]	62.5[e]	2.75	
Leadville (near)*†[1]	71	25	46.4	1.05	0.8
Leroy†	94	34	61.6	0.86	
Longmont†	95	32	60.6	1.67	
Longs Peak	74	15	48.0	1.95	4.5
Loveland	......	......	......	2.43	
Meeker†	85	25	55.4	3.66	
Millbrook†	88	23	56.2	1.19	
Minneapolis†	101	35	64.4	2.45	
Montrose†	89	30	62.4	1.66	
Moraine†	76	23	51.0	2.74	0.5
Pagoda†	91	23	55.0	3.17	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Paonia†	......	......	......	2.01	
Parachute†	86	38	62.0	4.12	
Pinkbamton*[6]	78	24	50.9	2.02	
Rangely	88	28	59.2	1.38	
Redcliff	......	......	......	0.63	
Rico†	75	26	50.6	4.46	
Rockyford†	97	38[c]	66.2[c]	1.85	
Saguache†	80	28	54.2	0.69	
St. Cloud†	......	......	......	2.27	
San Luis†	92	22	56.9	0.74	
Santa Clara*[1]	82	29	50.4	4.28	6.0
Seibert†	......	......	......	0.39	
Smoky Hill Mine†	85	21	52.6	1.92	
Springfield†	......	......	......	2.62	
Stamford*[1]	76	24	46.0	0.80	1.0
Steamboat Springs	89	22	58.5	2.02	
Sulphur Springs†	82	20	51.2	2.24	
Surface Creek†	87	24	59.2	2.99	
Thon†	97	32	59.6	2.61	T.
T. S. Ranch†	89	34	62.8	5.14	
Twin Lakes	......	......	......	1.50	
Wallet†	......	......	......	1.10	
Watkins*[1]	86	40	58.8	......	
Wray†	95[f]	31	61.3[f]	1.01	
Yuma	......	......	......	1.02	
Connecticut.					
Bridgeport	85	36	64.2	5.40	
Canton†	88	31	57.2	6.58	
Colchester	88	35	60.7	6.60	
Falls Village	......	......	......	6.25	
Greenfield Hill	......	......	......	6.08	
Hartford *b*	......	......	......	5.19	
Hartford *c g*	84	40	60.6	......	
Lake Konomoc	......	......	......	4.28	
Middletown	90	35	62.5	5.26	
New London†	81	36	61.8	2.49	
North Franklin	......	......	......	4.58	
North Grosvenor Dale	80	30	57.6	7.78	
Norwalk	85	33	62.1	5.42	
Southington*[1]	85	38	60.7	6.13	
South Manchester	......	......	......	5.21	
Storrs	87	34	59.8	7.03	
Voluntown†	87	31	60.6	6.25	
Wallingford†	......	......	......	4.12	
Waterbury	86	36	61.6	5.01	
West Cornwall†	81	32	58.6	5.36	
West Simsbury	......	......	......	5.96	
Windsor	84	36	60.6	5.49	
Delaware.					
Dover†	90	40	66.4	3.86	
Milford	92	39	68.4	1.22	
Millsboro	90	37	67.2	3.99	
Newark	92	36	65.7	4.45	
Seaford†	89	39	66.6	5.29	
Wilmington†	93	44	68.6	4.87	
District of Columbia.					
Distributing Reservoir*[5]	89	41	68.4	2.79	
Receiving Reservoir*[5]	89	43	68.2	3.17	
West Washington	93	39	66.9	3.26	
Florida.					
Amelia†	95	52	78.8	1.13	
Archer†	96	53	79.2	2.23	
Avon Park	94	67	81.3	5.37	
Bartow†	92	63	79.8	5.31	
Brooksville†	91	60	78.8	4.92	
Carrabelle†	95	55	79.6	3.81	
Clermont†	95	66	80.6	3.90	
Earnestville†	94	59	80.0	4.09	
Emerson†	98	50	79.2	3.02	
Eustis†	94	62	80.0	2.97	
Federal Point†	93	59	77.5	3.59	
Fort Meade†	94	60[b]	78.2[d]	5.42	
Frostproof*†[1]	91	70	78.6	7.01	
Gainesville†	95	58	79.3	6.17	
Grasmere†	92	64	79.4	4.02	
Kissimmee†	96	60	81.4	6.82	
Lake Butler†	98	60	80.1	6.85	
Lake City†	93	54	79.9	4.48	
Lemon City†	94	70	81.7	6.45	
Macclenny†	100	53	79.3	0.70	
Manatee†	94	61	79.0	7.56	
Merritts Island†	92	72	79.7	4.92	
Milton†	......	......	......	4.29	
Mullet Key†	89	69	80.7	3.66	
Myers†	90	68	80.2	11.12	
New Smyrna†	89	62	77.6	2.30	
Oakhill*[1]	92	74	82.4	......	
Ocala*†[1]	93	63	78.4	2.84	
Orange City	95	65	80.0	3.73	
Orlando†	92	59	78.2	3.88	
Oxford*†[1]	92	64	78.7	4.20	
Plant City†	94	60	79.7	7.76	
St. Francis†	94	58	78.4	3.44	
St. Francis Barracks	92	54	76.3	3.00	
Tarpon Springs†	91	61	78.6	4.41	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Georgia.	°	°	°	*Ins.*	*Ins.*
Adairsville†	97	40	74.0	4.73	
Alapaha†	101	50	79.2	2.48	
Albany†	100	50	79.2	2.43	
Allentown†	101	45	78.6	2.74	
Americus†	101	49	79.0	1.24	
Athens *b*	99	42	74.2	0.66	
Bainbridge†	100	49	78.9	0.78	
Blakely†	95	53	79.5	0.97	
Brag†	105	45	78.0	1.30	
Camak	101	42	76.0	3.10	
Canton†	......	......	......	1.69	
Cedartown	100	40	76.8	3.13	
Clayton†	91	37	68.4	9.59	
Columbus†	98	50	78.8	5.36	
Cordele†	100	44	78.8	2.90	
Covington	99	42	74.2	0.90	
Dahlonega†	95	38	70.8	1.82	
Diamond†	94	35	69.2	3.13	
Eastman†	103	49	78.8	2.44	
Elberton†	102	47	76.2	2.13	
Fleming†	99	50	76.4	3.25	
Fort Gaines†	97	48	77.7	1.09	
Gainesville†	99	43	74.2	1.62	
Gillsville†	100	43	74.5	1.48	
Griffin†	96	50	77.4	0.58	
Hephzibah*†[5]	95	56	78.4	4.25	
Lagrange†	98	47	77.6	3.58	
Lumpkin†	99	51	79.0	2.14	
Macon† *b*	102	39	77.2	0.68	
Marietta†	96	45	73.4	1.40	
Marshallville†	94	52	78.6	1.17	
Milledgeville†	98	46	76.1	1.63	
Millen†	107	40	75.5	0.84	
Monticello*†[1]	95	52	78.5	......	
Morgan†	100	42	77.5	1.03	
Newnan†	99	47	76.2	1.26	
Point Peter*[1]	96	42	73.5	1.25	
Poulan†	101	46	78.2	4.38	
Quitman†	94	53	77.7	2.73	
Ramsey†	100	40	75.6	3.58	
Rome†	97	42	73.6	3.45	
Talbotton†	......	47	......	2.04	
Thomasville†	98	53	80.0	7.62	
Toccoa†	97	45	72.9	2.32	
Union Point	93	47	73.8	0.42	
Washington	98	47	75.1	3.07	
Waycross†	100	52	78.0	1.83	
Waynesboro	99	42	75.2	1.88	
West Point†	97	48	75.8	3.67	
Idaho.					
American Falls	87	24	56.5	......	
Blackfoot†	82	25	57.0	0.23	
Boise Barracks†	90	33	59.4	0.38	
Burnside†	83	26	55.2	T.	
Chesterfield†	81	10	49.4	0.14	
Cœur d'Alene	88	32	57.6	......	
Corral*†[1]	83	28	53.4	1.08	
Dairy†	87	16	51.5	0.43	
Downey†	88	20	53.2	T.	
Fort Sherman†	88	31	56.4	0.96	
Gimlet†	86	23	53.4	0.85	
Idaho City†	89[d]	25[d]	56.8[d]	0.45	
Kootenai†	83	30	54.1	0.76	
Lost River†	......	......	......	0.25	
Martin†	80	12	48.6	0.24	
Minidoka†	95	24	55.2	0.06	
Moscow†	85	30	56.2	0.81	
Murray†	83	27	53.0	1.57	
Nampa	90	28	59.6	0.34	
Oakley†	87	29	58.6	0.55	
Ola	86	......	......	0.03	
Paris†	89	22	55.3	0.94	
Payette†	101	28	62.1	0.06	
Pollock†	94	32	60.2	0.47	
Rexburg†	86	20	55.2	0.09	
Roseberry†	82	19	49.2	0.27	
Salubria†*	96	29	58.6	0.25	
Shoup†[1]	94	30	62.3	0.72	
Soldier†	87	18	51.0	0.84	
Swan Valley†	85	16	52.8[e]	1.03	
Warren†	87	22	51.1	1.71	
Yellowjacket†	......	......	......	0.95	1.6
Illinois.					
Albion†	96	37	67.6	5.68	
Alexander†	96	31	65.4	5.49	
Ashton*†[1]	88	39	59.8	6.49	
Atlanta	......	......	......	4.82	
Atwood *a**†[1]	96	30	60.1	6.57	
Atwood *b*	......	......	......	5.44	
Aurora *a*	90	32	61.2	6.92	
Aurora *b*†	88	29	59.4	7.56	
Beardstown†	......	......	......	5.02	
Bloomington†	93	30	63.3	5.40	
Bushnell†	93	34	61.4	6.96	
Cambridge	87	37	60.6	5.45	
Carlinville†	97	36	65.8	3.87	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Carlyle	......	......	......	6.86	
Carrollton	90	38	62.4	4.58	
Cazenovia†	......	......	......	5.35	
Charleston	90	36	64.8	6.53	
Chemung *[1]	88	30	58.4	8.56	
Chester†	......	......	......	2.58	
Cisne *†[1]	98	30	64.2	6.64	
Clearcreek†	94	28	61.3	6.95	
Cobden†	98	34	68.2	2.38	
Decatur†	89	38	65.2	5.80	
Dixon†	89	34	60.2	4.66	
Dwight†	89	29	60.4	5.09	
East Peoria†	93	27	60.9	4.09	
Effingham†	97	33	68.3	3.80	
Evanston *[10]	86	40	62.1	......	
Fort Sheridan†	87	35	59.5	5.60	
Friendgrove *†[4]	......	34	62.2	7.56	
Galva†	89	35	60.7	6.68	
Glenwood *†[1]	86[e]	34	58.5	5.67	
Golconda†	97	34	68.6	3.01	
Grafton†	......	......	......	3.37	
Greenville†	98	37	67.4	5.82	
Griggsville†	......	......	......	9.32	
Halliday *[5]	97[d]	44[d]	71.7[d]	1.76	
Havana†	91	40	64.2	5.30	
Herrin *[1]	96	42	68.2	2.60	
Hillsboro†	94	37	65.5	4.80	
Iron†	98	42	69.7	4.27	
Joliet†	92	33	62.6	6.69	
Jordans Grove†	95	33	68.3	3.15	
Kankakee *a*†	82	35	58.8	5.82	
Kishwaukee	88	32	58.8	6.56	
Knoxville *a* *[5]	90	34	62.2	5.28	
Lagrange	87	34	59.4	5.39	
Laharpe *[1]	89	32	60.2	12.28	
Lanark *†[1]	87	27	57.4	4.78	
Loami†	......	......	......	3.99	
Louisville†	95	39	66.4	4.23	
McLeansboro†	98	38	67.6	3.91	
Martinsville†	92	34	64.6	4.30	
Martinton†	90	30	62.2	5.50	
Mascoutah *[5]	100	42	70.0	5.80	
Mattoon *[1]	96	41	66.4	6.11	
Minonk *†[1]	89	35	61.6	4.53	
Monmouth†	90	29	61.1	6.02	
Morrisonville†	95	33	63.7	4.44	
Mount Carmel†	......	......	......	4.15	
Mount Pulaski	92	38	64.5	5.06	
Mount Vernon	97	39	66.9	6.19	
New Burnside†	90	35	69.5	2.54	
Olney *a* *[1]	97	40	68.8	4.57	
Oregon†	89	30	59.4	5.61	
Oswego *[1]	87	32	58.7	7.51	
Ottawa†	92	33	61.2	9.38	
Palestine†	94	32	64.6	4.30	
Paris†	98	34	67.0	5.94	
Peoria *a*†	......	......	......	3.98	
Peoria *b*†	93	36	64.6	4.86	
Philo†	93	29	63.0	5.02	
Plumhill *†[3]	100[g]	39[g]	65.0[g]	5.88	
Rantoul *†[1]	90	35	62.1	5.73	
Reynolds	88	34	60.0	4.44	
Riley†	87	34	58.6	9.45	
Robinson *†[3]	92	40	63.6	4.68	
Rockford†	89	32	61.5	8.33	
Rose Hill *†[1]	94	42	71.8	6.93	
Roundgrove†	89	32	60.6	5.10	
St. Charles *†[1]	88	32	59.2	14.44	
St. John *†[1]	96	44	67.3	2.70	
Scales Mound†	86	28	58.5	5.11	
Streator†	89	32	64.2	3.44[g]	
Sycamore†	87	33	58.2	8.39	
Tiskilwa *†[3]	87	42	58.0	6.70	
Tuscola†	91	29	63.5	5.69	
Walnut†	91	32	62.6	5.94	
Wheaton *[3]	......	36	56.6	9.09	
Winnebago†	87	31	58.6	5.61	
Zion†	......	......	......	4.53	
Indiana.					
Anderson†	89	31	62.9	7.71	
Angola *[1]	92	28	60.4	5.90	
Auburn†	87	28	60.0	4.65	
Bedford	92	34	65.2	4.45	
Bloomington†	92	35	64.6	4.16	
Bluffton†	91	28	62.2	5.04	
Bright*	91	36	67.8	4.75	
Butlerville†	93	31	65.0	5.81	
Cambridge City†	88	31	60.8	5.27	
Columbia City *[1]	87	32	60.8	4.65	
Columbus†	92	32	63.0	4.57	
Connersville†	90	31	61.8	4.99	
Delphi†	91	33	63.5	4.82	
Edwardsville *†[1]	91	42	68.8	2.13	
Evansville†	94	35	68.2	5.22	
Farmland†	......	......	......	6.19	
Franklin *[1]	89	40	63.5	4.24	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Greencastle†	87	37	62.9	5.30	
Greensburg	......	......	......	6.36	
Hammond†	87	32	60.0	5.04	
Huntington	90	32	61.1	4.97	
Jasper†	97	35	67.6	6.50	
Jeffersonville	94	38	67.1	4.19	
Knightstown†	92	32	63.2	5.46	
Kokomo†	93	32	64.0	3.83	
Lafayette†	94	30	63.2	5.13	
Logansport *b*†	87	34	61.1	5.15	
Madison†	93	38	66.9	5.66	
Marengo	97	32	66.6	3.68	
Marion†	90	30	62.4	4.85	
Mauzy†	89	30	62.1	4.94	
Mount Vernon†	100	38	68.4	2.97	
Northfield†	90	32	61.7	5.12	
Princeton *†[1]	95	37	66.0	3.61	
Richmond	......	......	......	5.93	
Rockville†	92	32	63.9	5.10	
Scottsburg†	95	34	66.2	4.83	
Seymour†	94	37	65.1	5.10	
South Bend†	88	30	61.3	4.92	
Sunman	90	32	62.6	6.15	
Syracuse†	......	......	......	4.54	
Terre Haute†	95	40	67.0	4.73	
Tipton†	96	31	64.0	4.09	
Valparaiso†	88	34	60.9	4.95	
Vevay	95	36	68.0	4.35	
Vincennes†	97	31	65.0	4.53	
Warsaw†	87	35	62.8	4.32	
Washington†	95	38	66.0	5.00	
Worthington†	90	36	64.4	3.94	
Indian Territory.					
Eufaula†	......	......	......	2.21	
Healdton†	104[c]	38[c]	76.6[c]	0.97	
Kemp	104	41	77.2	1.56	
Lehigh†	106	36	76.9	1.55	
Purcell†	99	41	72.6	2.73	
Tahlequah†	102	32	74.6	1.87	
Tulsa†	......	......	......	1.50	
Iowa.					
Adair	......	......	......	4.23	
Afton	86	32	59.8	4.94	
Algona *[1]	83	32	56.6	2.31	
Alta *a*†	84	30	57.9	2.55	
Amana†	86	30	58.4	2.32	
Ames *b*	83	29	56.4	4.10	
Atlantic†	88	26	58.9	3.23	
Audubon	84	26	56.2	5.59	
Belknap	92	33	61.7	5.62	
Belleplaine	87	28	56.8	2.37	
Bonaparte†	95	32	61.0	7.09	
Carroll	85	29	57.4	4.31	
Cedarfalls†	80	28	57.1	4.90	
Cedar Rapids†	90	31	59.1	3.18	
Centerville†	88	39	62.6	8.06	
Chariton	85	34	59.5	3.76	
Charles City†	84	28	57.0	3.80	
Clarinda†	88	34	61.5	2.56	
Clinton	88	31	60.1	4.30	
College Springs	91	35	61.8	2.78	
Corning†	86	28	59.2	3.06	
Council Bluffs	......	......	......	3.16	
Cresco†	81	31	55.4	4.83	
Decorah†	83	29	55.2	4.11	
Delaware *[3]	......	33	56.4	6.19	
Denison†	83	33	57.9	3.90	
Dows	82	30	56.8	4.56	
Eldora	87	29	58.7	4.69	
Elkader†	85	26	56.4	5.08	
Estherville	87	28	56.8	2.40	
Fairfield†	89	30	59.2	5.33	
Fayette†	85	25	56.7	4.36	
Fonda	86	34	60.0		
Forest City	83	28	56.2	2.88	
Fort Madison *†[1]	85	40	62.8	7.43	
Galva†	87	30	57.7	3.46	
Gardengrove	87	30	58.0	4.51	
Glenwood†	91	29	59.6	3.15	
Grand Meadow *[1]	79	33	55.1	3.91	
Grundy Center	85	29	56.5	4.93	
Guthrie Center	84	28	57.4	3.93	
Hampton	85	32	56.7	4.42	
Hawkeye	......	......	......	4.27	
Hopeville†	84	36	60.2	4.99	
Humboldt†	85	29	58.1	4.66	
Independence† [4]	83	28	56.0	3.50	
Indianola†	85	34	60.2	5.40	
Iowa City *a*†	86	30	59.6	1.82	
Iowa City *b*	86	30	60.2		
Iowa Falls†	81	27	54.8	5.43	
Keosauqua†	93	38	61.8	9.04	
Knoxville	85	34	60.2	4.62	
Lansing	85	30	57.9	4.04	
Larchwood	......	......	......	4.98	
Larrabee†	87	28	56.5	2.16	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Leclaire†	......	......	......	3.15	
Lemars	90	31	62.4	2.15	
Lenox *[1]	83	37	59.9	2.91	
Logan†	86	30	58.8	4.05	
Madrid	86	32	59.4	3.89	
Malvern *[1]	95	30	60.1	3.32	
Maple Valley	......	......	......	2.59	
Maquoketa†	88	32	58.2	4.58	
Marshall†	84[e]	28[e]	57.4[e]	4.00	
Mason City†	78	22	55.1	3.28	
Maxon *[1]	91	38	60.4	3.55	
Mechanicsville	86	34	58.6	3.18	
Millman	......	......	......	4.39	
Monticello *†[1]	84	30	57.1	4.11	
Mooar	94	32	59.0	9.96	
Mountayr†	86	34	60.5	4.50	
Mount Pleasant *[1]	84	42	61.8	4.59	
Mount Vernon *[1]	86	38	59.7	3.79	
Neola	91	30	58.8	3.24	
Newton†	85	31	57.7	3.40	
North McGregor†	......	......	......	3.16	
Northwood	80	30	55.7	2.36	
Ogden	87	31	58.6	3.82	
Osage *†[3]	......	31	52.4	3.48	
Osceola	86	34	60.5	5.03	
Oskaloosa†	87	28	59.0	2.29	
Ottumwa	91	34	60.4	4.89	
Ovid†	87	34	60.4	5.06	
Panama†	85	33	58.8	4.62	
Plover	......	......	......	3.98	
Portsmouth	90	29	59.6	4.10	
Primghar	86	28	58.5	2.11	
Reinbeck	......	......	......	4.24	
Rock Rapids	86	25	54.4	4.68	
Sac City†	86	30	58.4	3.00	
St. Charles	85	35	57.6	2.77	
Scranton	84	30	58.2	3.75	
Seymour†	89	35	61.1	5.10	
Sibley	84	27	56.0	6.67	
Sidney	88	36	61.0	3.16	
Sigourney	89	30	60.7	1.90	
Spencer	85	28	56.4	2.73	
Spirit Lake†	88	28	57.4	2.80	
Toledo	82	27	57.0	3.82	
Villisca†	88	27	59.0	2.89	
Vinton *[1]	84	30	57.4	4.03	
Washington†	89	31	59.7	2.94	
Waterloo	84	29	57.8	4.36	
Waukee	90	30	60.2	3.58	
Waverly	80	30	57.2	3.37	
Webster City	80	32	56.8	5.07	
Westbend *†[1]	85	29	55.2	2.82	
Wilton Junction†	87	29	60.6	4.04	
Winterset†	87	26	57.0	5.00	
Kansas.					
Abilene†	98	33	66.2	5.43	
Achilles *[3]	......	38[f]	58.5[f]	2.05	
Altoona *†[3]	98	38	65.0	4.63	
Assaria *[5]	98	30	63.8	1.40	
Atchison†	94	36	64.1	3.92	
Augusta	97	32	67.7	4.45	
Baker	91	36	61.7	6.16	
Beloit†	93	35	64.4	3.25	
Campbell	95	32	63.4	4.73	
Colby†	98	31	61.5	1.47	
Coldwater	105	38	71.4	1.12	
Columbus†	96	36	67.6	4.35	
Coolidge†	101	33	64.8	1.70	
Cunningham†	106	29	68.2	3.17	
Delphos *[1]	94	37	65.2	3.25	
Downs	......	......	......	4.24	
Dresden *†[1]	96	36	62.7	1.80	
Effingham	94	39	65.3	......	
Elgin *[1]	99	36	67.7	2.65	
Ellinwood†	99	34	65.9	2.57	
Emporia†	91	35	65.5	1.90	
Englewood†	106	28	67.6	2.60	
Eureka†	......	......	......	4.14	
Eureka Ranch†	100	32	61.8	1.37	
Fort Riley†	96	33	66.7	5.75	
Fort Scott†	92	39	66.4	4.25	
Frankfort	99	35	67.4	4.39	
Garfield	......	......	......	1.80	
Gibson *[5]	96	32	62.6	1.00	
Gove *†[1]	98	36	64.1	4.15	
Grainfield *[6]	106	38	65.1	3.50	
Grenola *[1]	97[e]	35	66.7	3.10	
Halstead	94	34	64.5	3.17	
Hays†	101	35	64.2	5.80	
Horton†	92	38	63.6	5.28	
Hutchinson†	98	35	68.7	6.44	
Independence†	101	37	70.0	3.47	
Lawrence	92	39	65.4	3.46	
Lebo†	95	34	66.4	3.66	
Linn†	......	......	......	3.76	
Macksville†	104	33	66.0	3.37	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Kansas—Cont'd.					
McPherson†	99	31	66.6	3.57	
Manhattan *b*	97	33	65.6	5.06	
Manhattan *c*	95	32	65.8	4.84	
Marion†	97	30	68.0	1.92	
Meade†	.....	.....	.....	0.77	
Medicine Lodge†	108	31	69.2	2.17	
Minneapolis†	99	31	65.4	4.83	
Morantown†	92	40	66.4	5.10	
Morland†	97	32	62.5	3.20	
Morton†	99	35	67.4	2.01	
Mounthope*[1]	97	38	67.6	4.07	
Ness City†	100	32	67.0	1.08	
Norton†	95	30	59.9	1.85	
Norwich†	105	36	68.8	2.71	
Oberlin†	.....	.....	.....	1.60	
Olathe†	94	38	65.5	3.18	
Osage City†	95	32	65.4	3.13	
Oswego	98	40	70.8	3.11	
Ottawa†	95	34	65.2	2.78	
Paola†	94	38	67.4	4.20	
Phillipsburg†	98	30	63.0	2.88	
Pleasant Dale†	105	32	67.3	2.02	
Pratt†	101	35	67.4	2.40	
Rome*†[1]	99	37	68.3	3.68	
Salina†	97	31	66.2	3.07	
Scott City†	101	29	63.6	1.81	
Sedan†	100	35	68.9	3.48	
Sharon Springs*[1]	102	43	65.4	1.25	
Toronto	97	32	67.2	3.72	
Ulysses†	102	38	66.8	1.12	
Wakefield*[1]	100	38	69.9	6.36	
Wallace*[1]	103	36	65.2	1.06	
Wamego*[1]	96	34	63.6	4.11	
Wellington*[1]	96	36	70.0	3.11	
White Rock	.....	.....	.....	3.97	
Winona*[1]	98	36	61.5	1.75	
Yates Center†	97	33	67.4	3.96	
Kentucky.					
Alpha†	97	39	71.1	5.22	
Bardstown†	93	35	68.4	2.83	
Blandville†	96	37	67.4	3.27	
Bowling Green *a**[1]	94	33	66.0	4.02	
Bowling Green *b*†	96	40	71.2	3.82	
Burnside†	.....	.....	.....	2.20	
Caddo†	96	36	67.3	4.83	
Canton*†[1]	95	40	68.4	2.32	
Carrollton†	97	35	68.0	4.62	
Catlettsburg*†[1]	91	44	69.0	4.75	
Earlington	95	39	69.0	5.45	
Edmonton†	90	36	68.1	3.28	
Eubank†	95	31	67.8	4.30	
Falmouth†	.....	.....	.....	3.73	
Fords Ferry†	98	44	70.4	6.17	
Frankfort†	94	41	67.0	5.01	
Franklin*†[1]	99	45	71.4	3.54	
Georgetown	92	34	67.4	.....	
Greendale*[1]	92	41	67.2	3.76	
Greensburg†	94	38	69.4	3.60	
Harrods Creek†	97	43	70.9	3.90	
Henderson†	96	41	70.8	4.12	
Hopkinsville†	95	42	69.4	3.40	
Leitchfield†	95	37	67.2	3.54	
Lola†	96	30	68.4	2.65	
Louisa† *a*	95	36	66.4	3.72	
Marrowbone†	97	33	69.2	4.88	
Maysville†	99	37	69.0	3.43	
Middlesboro†	96	36	68.8	1.79	
Mount Sterling†	93	32	65.1	2.25	
Munfordville*†[1]	93	44	70.9	4.48	
Owensboro†	92	41	67.5	4.18	
Owenton†	94	35	67.8	4.46	
Paducah *a*†	.....	.....	.....	2.87	
Paducah *b*†	100	43	71.0	2.82	
Pilot Oak†	97	40	73.0	1.86	
Pleasure Ridge Park†	96	30	66.6	3.75	
Princeton†	98	36	69.6	3.74	
Richmond	92	39	68.4	3.14	
Russellville†	99	40	71.0	4.80	
St. John†	92	34	66.8	3.60	
Sandyhook†	.....	.....	.....	3.00	
Shelbyville†	98	31	68.0	3.42	
Southfork†[2]	.....	.....	65.9	2.96	
Vanceburg†	90	34	64.9	3.15	
Williamsburg†	94	40	69.3	4.50	
Louisiana.					
Abbeville	95	46	80.8	0.46	
Alexandria†	99	43	76.8	3.66	
Amite†	95	44	76.8	4.42	
Bastrop†	103	42	78.0	2.33	
Baton Rouge†	97	45	77.8	1.14	
Calhoun†[3]	101	42	74.9	3.71	
Cameron†	99	53	81.8	2.87	
Cheneyville†	97	40	76.6	2.35	
Clinton†	92	45	75.2	4.55	
Covington†	96	39	75.4	3.78	
Davis	98	39	73.9	3.62	
Louisiana—Cont'd.					
Donaldsonville†	94	50	78.8	2.62	
Elm Hall	88	42	73.5	.....	
Emilie†	91	46	76.0	4.16	
Farmerville	100	43	75.6	3.50	
Franklin†	92	48	77.6	1.98	
Grand Coteau	92	45	76.6	0.85	
Hammond†	93	44	76.4	3.56	
Houma	94	45	77.4	5.72	
Jeanerette†	97	44	79.8	1.67	
Lafayette†	97	41	77.3	1.19	
Lake Charles†	93	55	77.4	2.71	
Lawrence†	94	54	80.0	5.38	
Liberty Hill	100	41	76.6	4.11	
Mansfield†	100	38	76.2	3.27	
Maurepas	95	43	77.0	3.12	
Melville†	94	48	76.7	1.80	
Minden†	102	43	78.0	4.77	
Monroe†	98	52	78.0	3.08	
New Iberia	92	47	78.2	2.39	
Oakridge†	105	38	77.0	1.47	
Oberlin	99	45	76.2	2.10	
Opelousas†	96	41	77.3	4.30	
Oxford†	100	38	76.2	3.29	
Paincourtville†	95	44	76.9	0.95	
Plain Dealing†	99	45	78.6	5.07	
Rayne†	100	41	78.9	1.69	
Robeline†	100	36	75.4	3.53	
Ruston	99	.....	.....	3.50	
Schriever†	98	37	76.2	3.28	
Shellbeach†	93	49	78.8	1.54	
Southern University†	95	48	76.8	4.18	
Sugar Ex. Station†	93	53	76.2	4.70	
Sugartown†	97	50	77.8	1.88	
Thibodeaux	.....	.....	.....	1.70	
Venice†	92	52	78.5	7.87	
Wallace	92	49	77.4	3.52	
West End	.....	.....	.....	6.19	
White Sulphur Springs†	98	45	77.0	3.73	
Maine.					
Bar Harbor	84	29	56.8	6.04	
Belfast*[6]	74	40	57.3	10.32	
Calais	80	29	55.8	5.69	
Cornish*[1]	86	36	57.2	7.04	
Cumberland Mills	83	37	59.0	8.64	
Fairfield	84	30	57.0	5.10	
Farmington†	97	30	59.0	4.62	
Flagstaff†	92	24	52.8	4.53	
Fort Fairfield†	80	24	47.6[4]	4.27	
Gardiner	86	36	58.8	7.60	
Kineo†	82	33	55.0	3.27	
Lewiston	90	38	59.0	6.73	
Mayfield	87	28	54.0	5.31	
North Bridgton	86	32	58.0	6.26	
Orono	87	28	55.5	8.00	
Petit Menan*[1]	65	42	53.9	.....	
Winslow	88	30	57.6	5.86	
Maryland.					
Annapolis	90	46	68.4	.....	
Bachmans Valley	90	33	64.5	2.58	
Boettcherville*[1]	88	40	63.4	6.90	
Cherryfields†[2]	.....	.....	67.8	3.47	
Chestertown†	90	41	67.0	5.37	
Collegepark	95[e]	34[e]	65.7[e]	4.15	
Cumberland *a*	89	38	65.2	5.56	
Cumberland *b*	94	40	69.4	5.77	
Darlington†	90	40	65.7	4.85	
Deerpark	87	29	59.5	5.32	
Easton†	94	38	67.4	2.69	
Fallston*[1]	91	41	65.3	3.62	
Flintstone	94	30	63.4	8.07	
Frederick *a*	93	39	67.0	3.08	
Grantsville	90	33	60.9	5.85	
Greatfalls*[5]	92	41	67.9	3.32	
Greenspring Furnace	93	32	66.0	5.02	
Hagerstown†	93	40	68.0	2.20	
Jewell†	92	43	67.8	3.71	
Johns Hopkins Hospital	92	44	67.4	.....	
Laurel	92	37	67.2	3.93	
Mardela Springs†	88	39	66.6	6.90	
Mount St. Marys Coll.†	93	42	67.0	3.16	
New Market	93	40	66.5	4.10	
Pocomoke City	90	42	70.2	5.71	
Princess Anne	88	33	64.8	5.77	
Sharpsburg	93	38	65.9	4.17	
Solomons†	93	48	71.0	3.24	
Sunnyside	86	28	59.3	7.21	
Taneytown†	98	38	68.2	2.85	
Van Bibber	87	41	66.4	4.24	
Western Port	93	35	65.6	5.46	
Woodstock	92	34	65.0	2.83	
Massachusetts.					
Adams	85	37	59.8	.....	
Amherst	85	32	59.4	6.17	
Andover†	90	31	59.4	5.30	
Ashland	.....	.....	.....	8.05	
Attleboro	.....	.....	.....	8.75	
Massachusetts—Cont'd.					
Bedford	83	35	59.4	6.73	
Beverly Farms	77	35	58.6	8.09	
Bluehill (summit)	88	36	59.8	10.23	
Bluehill (valley)	90	30	60.1	9.03	
Boston *a*	.....	.....	.....	7.53	
Brockton *a*	88	36	61.4	6.26	
Brockton *b*	.....	.....	.....	7.25	
Brockton *c*	.....	.....	.....	8.09	
Buzzards Bay	80	35	59.5	9.17	
Cambridge *a*	91	35	61.9	6.18	
Chestnut Hill	92	35	62.1	7.16	
Clinton *b*	86	36	60.2	.....	
Cohasset	.....	.....	.....	6.19	
Concord†	90	32	60.1	6.69	
Dudley[1]	91[e]	35	60.2	5.90	
East Templeton*[1]	85	36	56.8	4.83	
Egg Rock, Nahant	78	40	60.8	.....	
Fallriver	83	40	62.8	8.03	
Fitchburg *a**[1]	84	37	58.6	6.59	
Fitchburg *b*	88	34	59.4	6.32	
Framingham	89	32	61.5	7.39	
Groton	86	31	59.0	7.30	
Hadley	89	28	59.0	5.69	
Hingham	.....	.....	.....	5.77	
Hobbs Brook	.....	.....	.....	6.81	
Hyannis*†[1]	83	40	65.0	5.38	
Hydepark*[6]	.....	40	61.7	.....	
Lake Cochituate	93	30	61.2	8.19	
Lawrence	86	37	61.0	6.92	
Leeds	84	32	59.1	6.19	
Leicester Hill	87	30	58.4	7.81	
Leominster	.....	.....	.....	7.18	
Long Plain	.....	.....	.....	8.05	
Lowell *a*	85	36	60.9	9.69	
Lowell *b*	90	34	59.7	.....	
Lowell *c*	91	38	61.9	.....	
Ludlow Center	80	27	55.8	5.27	
Mansfield*[1]	85	30	59.3	10.85	
Middleboro	86	31	60.2	8.17	
Milton	82	40	59.2	8.42	
Monroe	82	30	54.4	6.28	
Monson	86	33	60.6	6.20	
Mount Nonotuck	.....	.....	.....	6.17	
Mount Wachusett	.....	.....	.....	6.82	
Mystic Lake	.....	.....	.....	7.11	
Mystic Station	.....	.....	.....	6.37	
Natick*[1]	81	41	60.2	8.13	
New Bedford *a*	78	38	61.4	8.87	
New Bedford *b*	83	38	61.9	7.76	
North Billerica	89	37	61.0	7.75	
Pittsfield	82	36	58.4	6.70	
Plymouth*[1]	81	43	60.4	5.65	
Princeton	.....	.....	.....	6.94	
Quinapoxet	80	34	64.6	7.00	
Salem	.....	.....	.....	6.55	
Somerset*[1]	94	40	65.5	7.74	
South Clinton	.....	.....	.....	7.58	
Springfield Armory	88	32	59.0	6.24	
Sterling	.....	.....	.....	7.69	
Taunton *b*	86	33	60.2	8.91	
Taunton *c*	86	31	59.9	9.21	
Wakefield†	88	33	60.5	8.20	
Waltham	.....	.....	.....	7.22	
Webster	.....	.....	.....	7.83	
Westboro†	87	32	61.4	7.74	
Weston	84	34	60.6	7.15	
Williamstown*[1]	82	39	58.8	4.83	
Winchendon	.....	.....	.....	6.10	
Winchester	.....	.....	.....	7.99	
Worcester *a*[e]	86	35	57.0	.....	
Worcester *b*	82	36	59.9	7.45	
Michigan.					
Adrian	88	27	59.8	5.26	
Allegan	88	28	59.6	8.04	
Alma	86	26	57.1	7.31	
Ann Arbor	83	32	58.0	4.93	
Arbela	85	28	57.2	6.03	
Badaxe†	79	29	55.9	5.11	
Ball Mountain	83	29	57.6	5.26	
Baraga	83	29	54.4	1.05	
Battlecreek	88	29	59.4	6.60	
Bay City *a*	84	28	57.0	4.65	
Bay City *b*	84	29	57.4	4.24	
Benton Harbor	88	30	60.7	4.94	
Berlin*[1]	93	24	58.6	4.72	
Berrien Springs	88	30	60.4	6.39	
Big Rapids	82	25	55.3	6.96	
Birmingham	86	30	58.0	4.98	
Bois Blanc*[10]	74	34	55.6	.....	
Boon	79	25[e]	52.2	7.21	
Bronson	89	29	60.2	6.35	
Calumet	72	33	52.2	1.27	T.
Camden	85	29	57.8	4.89	
Charlevoix	79	32	55.8	3.50	
Cheboygan	83	27	53.9	4.14	
Clinton	90	27	50.2	5.52	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	Ins.	Ins.
Escanaba †	74	32	54.1	2.84	
Fairview	84	30	57.6	4.86	
Fitchburg	88	24	57.9	5.52	
Flint	86	26	57.0	5.60	
Gaylord	76	25	51.9	6.33	
Gladwin	83	24	54.8	4.50	
Grand Rapids *b*	87	31	59.1	6.97	
Grape	89	29	60.4	3.87	
Grayling	78	22	53.4	4.73	
Hanover	86	25	59.0	5.10	
Harrison	80	27	53.7	6.95	
Harrisville	87	27	56.0	6.42	
Hastings	87	30	57.9	6.73	
Hayes	80[e]	29[e]	57.0[e]	6.05	
Hesperia	85	24	57.0	5.79	
Highland Station	......	......	......	4.69	
Holland *[10]	78	40	61.1	......	
Howell	......	......	......	4.45	
Ionia*	87	26	58.2	4.32	
Iron River	78[c]	19[c]	48.8[c]	1.28	T.
Ivan	80	26	54.2	5.83	
Jeddo	86	29	56.6	4.99	
Kalamazoo	87	30	59.7	8.32	
Lake City	79	26	55.2	5.55	
Lathrop	76	22	49.8	1.98	T.
Lewiston	78	29	54.4	5.98	
Ludington *[10]	75	30	55.8	......	
Luzerne	79	24	51.6	6.05	
Mackinaw City	80	28	53.1	3.77	
Madison	86	30	59.7	4.43	
Mancelona	77	26	53.0	4.80	
Manistique	68	29	52.1	2.89	
Mayville	85	30	58.2	4.67	
Middle Island *[10]	69	36	54.9	......	
Midland	86	26	57.1	4.39	
Mottville	91	27	60.2	5.68	
Mount Clemens	88	28	58.3	4.83	
Mount Pleasant *a*	85	27	57.7	5.74	
Mount Pleasant *b*	84	28	56.8	6.00	
Muskegon	83	31	58.2	5.40	
Newberry [4]	75	25	49.8	......	
North Manitou Island *[10]	74	30	56.3	......	
North Marshall	82	28	57.4	6.08	T.
Northport	76[f]	34[f]	56.0[f]	3.21	
Old Mission	79	32	56.0	5.37	
Olivet	81	31	57.8	6.16	
Ovid	84	29	57.5	5.69	
Owosso	84	27	57.0	6.92	
Parkville	......	......	......	6.84	
Petoskey	81	31	54.7	4.51	
Plymouth	88	29	58.2	4.60	
Pontiac	83	29	57.0	5.75	
Port Austin	83	29	56.1	4.51	
Powers	73	26	50.6	1.87	
Reed City	83	24	54.5	7.40	
Rogers City	77	27	53.6	5.36	
Romeo	87	29	57.8	5.30	
Saginaw	85	27	57.2	5.17	
St. Ignace	72	28	53.8	3.15	
St. Johns	87	30	58.7	5.47	
Sandbeach *a*	86	30	58.0	5.56	
Saranac	87	25	58.8	6.31	
Sault Ste. Marie	......	......	......	......	T.
Somerset [f]	80	27	56.1	5.15	
South Haven	87	34	58.4	7.68	
Stanton	84	26	56.8	5.87	
Sturgeon Point *[10]	84	31	55.0	......	
Thornville	86	30	59.6	4.84	
Thunder Bay Island *[10]	84	37	55.9	......	
Traverse City	83	31	55.3	6.07	
Two Heart River *[10]	80	30	52.9	......	
Vandalia	85	33	60.1	6.20	
Waverly	94	27	59.5	5.84	
Wetmore	75	24	51.3	2.06	
Ypsilanti	84	29	59.4	4.31	
Minnesota.					
Ada †	88	22	54.4	2.15	
Albert Lea †	77	32	56.0	2.00	
Alexandria †	86	28	54.8	3.04	
Beardsley †	97	25	56.5	2.62	
Belleplaine *[1]	78	38	56.7	2.93	
Bingham Lake †	85	27	56.8	......	
Bird Island	86	27	55.8	2.17	
Blooming Prairie †	84	31	54.5	3.05	
Bonniwell †	84	30	54.2	2.08	
Breese †	83	18	51.4	1.73	
Caledonia †	84	31	56.2	4.43	
Cambridge †	79	26	54.1	2.94	
Collegeville	83	30	56.6	2.48	
Crookston †	84	26	53.2	2.29	
Detroit City †	86	26	54.6	3.31	
Duluth	......	......	......	......	T.
Farmington †	82	27	54.2	2.28	
Fergus Falls †	85	26	55.0	2.70	
Glencoe †	83	24	56.0	1.67	
Glenwood †	87	26	55.8	2.32	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Minnesota—Cont'd.	°	°	°	Ins.	Ins.
Grand Meadow †	81	26	55.0	3.62	
Granite Falls †	91	27	56.1	3.30	
Lakeside †	85	16	54.3	1.70	
Lake Winnibigoshish [1]	78*	29	50.7	2.67	
Lambert †	83	19	51.6	2.31	
Lawrence †	82	26	54.6	2.80	
Leech Lake [1]	77*	24	50.4	1.95	
Lesueur *[1]	86	28	56.3	2.38	
Long Prairie †	81	24	54.9	3.80	
Lutsen	71	27	50.1	2.45	
Luverne †	83	29	55.7	4.33	
Mapleplain	82	28	55.6	2.59	
Maplewood *[1]	80	35	55.8	......	
Mazeppa [1]	88*	24	53.0	0.60	
Milan †	91	24	57.2	1.79	
Minneapolis *a* †	84	31	56.2	2.42	
Minneapolis *b* [1]	82*	26	54.3	2.55	
Minnesota City *†[1]	80	30	55.4	3.03	
Montevideo †	91	29	56.6	2.06	
Morris	86	22	55.6	2.43	
Mount Iron †	75	22	50.2	2.60	
New London	81	25	58.2	1.72	
New Richland [4]	78	28	55.6	......	
New Ulm †	85	31	56.0	3.35	
Park Rapids †	82	23	52.4	1.89	
Pine River *[1]	79	34	54.0	1.82	
Pleasant Mounds †	82	28	55.6	3.12	
Pokegama Falls [1]	79*	18	50.2	1.72	
Redwing †	......	......	......	2.79	
Reeds †	......	......	......	3.19	
Rolling Green	80	30	55.4	2.30	
Roseau *	75	19	48.6	1.44	
St. Charles †	78	27	55.0	3.06	
St. Cloud	80	28	54.6	2.59	
St. Olaf	85	29	55.1	4.09	
St. Peter	81	30	56.2	2.10	
Sandy Lake Dam [1]	75*	24	51.9	1.90	
Sauk Center	83	23	52.3	2.55	
Shakopee [6]	82*	29	57.7	1.80	
Tower †	76	18	51.9	1.90	
Two Harbors †	74	28	53.0	1.66	
Wabasha *[1]	83[f]	32[f]	54.8[f]	3.06	
Willmar †	84	27	55.1	3.20	
Winona	79	31	55.2	3.19	
Worthington	82	28	55.5	4.75	
Zumbrota [1]	82*	24	55.9	......	
Mississippi.					
Aberdeen †	99	40	73.2	0.65	
Agricultural College	98	42	76.2	1.03	
Austin †	95	44	73.8	2.56	
Batesville †	96	35	71.6	1.34	
Biloxi †	93	50	77.0	3.63	
Booneville †	99	41	73.6	0.73	
Briers †	92	46	74.3	0.96	
Brookhaven †	100	38	76.4	2.48	
Canton †	96	44	76.3	1.22	
Columbus *a* †	......	......	......	2.02	
Columbus *b* †	103	44	76.4	1.84	
Corinth †	100	38	73.6	0.96	
Crystal Springs †	98	44	76.9	1.10	
Edwards	98	40	77.4	0.65	
Enterprise †	96	42	74.3	3.23	
Fayette †	97	42	77.0	1.56	
French Camps †	98	33	71.8	1.72	
Fulton †	96	42	73.3	0.61	
Greenville *a*	94	47	75.1	0.71	
Greenville *b* †	100	44	75.9	0.74	
Hazlehurst †	99	41	77.0	0.62	
Hernando †	98	38	73.3	0.28	
Holly Springs †	97	38	73.2	1.40	
Jackson †	98	43	75.2	1.04	
Kosciusko †	99	38	72.4	1.40	
Lake †	95	42	74.0	3.67	
Leakesville †	96	43	76.8	1.10	
Logtown †	92	43	76.6	3.75	
Louisville †	98	41	74.8	3.81	
Macon †	102	42	76.6	0.31	
Magnolia †	96	44	76.1	5.64	
Mayersville	97	39	75.4	0.75	
Mosspoint	92	54	78.4	1.25	
Natchez †	97	46	77.8	0.20	
Okolona †	100	40	74.8	0.63	
Palo Alto †	100	43	77.4	1.52	
Pontotoc †	98	36	73.0	0.97	
Port Gibson †	101	37	76.4	0.60	
Rosedale †	95[e]	37[e]	70.8[e]	2.08	
Stonington *[1c]	96	50	76.4	......	
Thornton †	97	45	76.7	0.63	
Topton *[3]	96*	50	78.8	1.00	
University †	96	41	75.8	0.53	
Water Valley *†[1]	100	38	73.6	1.55	
Waynesboro *b* †	95	48	76.7	1.15	
Windham †	97	42	77.0	1.59	
Woodville †	93	44	70.4	1.73	
Yazoo City †	103	39	76.5	0.58	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri.	°	°	°	Ins.	Ins.
Akron	......	......	......	6.86	
Arthur *†[3]	......	40	63.8	3.17	
Bethany	88[j]	34[j]	57.6[j]	4.87	
Birchtree	96	35	66.7	3.29	
Bolckow †	......	......	......	4.92	
Boonville †	......	......	......	4.11	
Brunswick	90	40	63.6	7.27	
Carrollton †	90	41	64.2	5.67	
Cedargap *[1]	98	38	66.5	4.20	
Conception	86	39	61.4	4.17	
Cowgill *[5]	90	38	63.4	3.14	
Darksville †	85	38	62.4	5.85	
Downing	......	......	......	5.29	
East Lynne *[3]	......	34	60.3	3.40	
Edgehill *[5]	92	40	65.9	4.25	
Eightmile *[1]	89	38	62.6	3.57	
Eldon *[1]	96	38	67.7	3.74	
Elmira	96	30	64.3	2.87	
Emma *[3]	......	42	65.6	3.50	
Farmersville	......	......	......	4.77	
Fayette	95	36	65.6	3.56	
Fulton	......	......	......	3.28	
Gallatin *[1]	90	38	62.2	5.54	
Gayoso *[3]	......	42	67.2	3.80	
Glasgow	94	37	64.1	4.05	
Gordonville *[3]	......	39	63.8	3.30	
Gorin *[3]	90	37	60.1	6.71	
Grovedale	95	30	67.8	4.39	
Halfway	98	36	66.6	4.26	
Harrisonville †	94	40	64.9	3.38	
Hastian	95	34	65.1	3.23	
Hermann †	......	......	......	2.27	
Houston	94	35	66.6	4.64	
Houstonia (near)	......	......	......	4.41	
Irena	......	......	......	3.93	
Ironton †	97	31	65.6	4.36	
Jefferson City †	92	38	66.0	1.65	
Kidder	92	36	62.7	3.50	
Lamar †	92	40	67.0	4.80	
Lamonte	......	......	......	2.88	
Lebanon	92	39	68.0	5.43	
Lexington †	92	39	64.0	5.53	
Liberty	95	38	66.4	2.92	
McCune *†[1]	98	32	63.9	3.34	
Macomb	......	......	......	4.60	
Marblehill	98	33	66.2	4.38	
Marceline	94	35	61.6	7.06	
Marshall	95	33	64.2	4.17	
Maryville	90	34	61.4	2.93	
Mexico †	95	34	64.9	3.45	
Mine La Motte †	91	36	65.6	3.25	
Mineralspring	92	37	68.0	2.71	
Montreal *[1]	90	41	63.3	6.58	
Mount Vernon	95	34	67.0	3.13	
Neosho	93	39	68.9	4.44	
Nevada	......	......	......	4.38	
New Haven *[1]	94	43	69.6	2.55	
New Madrid	97	42	71.4	4.25	
New Palestine *†[1]	91	43	65.2	2.58	
Oakmound	......	......	......	3.15	
Oakridge *[4]	......	39	65.8	2.22	
Olden †	97	37	66.5	4.01	
Oregon *a*	92	40	64.0	4.27	
Oregon *b* *[1]	92	38	61.6	4.35	
Osceola †	......	......	......	3.05	
Oto	......	......	......	5.00	
Palmyra *[5]	94	42	65.8	6.85	
Phillipsburg *†[1]	92	41	65.4	6.10	
Pickering *[3]	92	34	63.7	3.35	
Platte River *[3]	88	36	59.4	2.21	
Poplar Bluff	97	36	68.4	5.32	
Potosi	91	28	63.1	4.47	
Princeton *[1]	85	34	61.4	5.79	
Rhineland	91	35	66.4	2.01	
Rolla	......	......	......	4.06	
St. Charles	95	40	67.0	3.08	
St. Joseph †	......	......	......	3.46	
St. Louis	94	35	65.1	2.49	
Sarcoxie *[3]	......	42	65.0	3.93	
Shelbina	......	......	......	5.30	
Sikeston	97	40	69.2	4.00	
Steffenville	......	......	......	7.28	
Stellada †	94	35	65.4	3.16	
Sublett	92	31	60.5	8.17	
Trenton	98	37	62.4	......	
Unionville †	91	37	61.4	6.41	
Versailles	......	......	......	3.20	
Virgil City	......	......	......	5.07	
Warrenton	93	38	65.4	2.44	
Wheatland	......	......	......	3.75	
Willow Springs	98	37	67.6	3.88	
Zeitonia *[1]	101	34	69.8	3.05	
Montana.					
Agricultural College	81	27	51.0	2.91	
Augusta †	90	29	52.3	2.62	
Bigtimber †	90	32	54.2	2.81	2.5

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Montana—Cont'd.					
Bozeman †	83	26	51.3	3.60	
Butte †	81	24	50.8	1.95	T.
Chinook †	90	31	53.0	1.66	
Choteau †	90	25	49.4	2.53	T.
Cokedale †	88	25	51.6	3.81	13.0
Columbia Falls †	83[e]	27[e]	53.2[e]	2.20	
Fort Custer †	93	30	55.6	0.72	
Fort Keogh †	92	25	55.8	0.29	
Fort Logan †	80	27	50.6	......	7.0
Fort Missoula	87	29	52.1	1.74	
Glasgow †	91	21	53.0	0.43	
Glendive †	90	29	54.0	0.75	
Greatfalls †	91	32	55.0	2.06	T.
Helena	......	......	......	......	5.8
Hogan †	82	19	49.8	3.47	14.0
Kalispell †	84	28	51.8	3.15	
Kipp †	......	......	......	6.02	12.0
Lewistown †	85	13	48.4	2.86	14.0
Libby †	92	24	54.6	1.37	
Livingston †	87	28	53.0	2.37	
Manhattan †	84	26	49.7	2.35	T.
Martinsdale †	81	25	49.4	2.49	12.0
Marysville †	80	25	48.0	2.24	11.7
Poplar †	90	24	53.8	0.15	
Radersburg †	......	23	......	2.00	
St. Ignatius Mission	84	30	53.0	2.77	
St. Pauls †	85	30	52.1	0.22	
Troy †	87	27	54.2	1.39	
Utica †	88	20	50.8	2.38	....
Virginia City †	80	25	51.0	1.73	4.0
White Sulphur Springs †	......	......	......	1.20	4.0
Wibaux †	98	18	50.9	1.55	
Yale †	......	......	......	2.21	2.0
Nebraska.					
Agee *[1]	94	33	58.6	2.73	
Alliance *[1]	84	32	55.7	1.41	
Ansley †	93	26	59.0	2.55	
Arapaho	......	......	......	1.70	
Arborville *[1]	91	32	63.3	2.85	
Arcadia	90	28	60.4	2.45	
Ashland *a* †	92	36	61.6	5.45	
Ashland *b* *[1]	93	38	61.5	5.13	
Ashton	94	31	60.7	2.66	
Auburn *†[1]	90	30	62.2	4.01	
Aurora *[1]	89	36	60.3	3.10	
Bassett	94	24	57.4	2.11	
Beatrice †	89	32	61.3	2.01	
Beaver City †	95	33	62.6	2.15	
Benkelman *[1]	96	32	59.6	0.75	
Bluehill *[1]	92	38	62.8	3.05	
Bratton	......	......	......	3.11	
Brokenbow *[1]	90	30	63.5	2.14	
Burchard	......	......	......	2.53	
Burwell *[1]	82	40	60.5	0.92	
Callaway †	89	32	61.2	2.20	
Central City *[5]	87	40	65.7	2.37	
Chester *[1]	92	36	60.2	2.96	
Columbus †	88	33	59.8	2.37	
Cook	92	32	66.2	2.79	
Cornlea	......	......	......	3.48	
Creighton †[1]	86	28	55.9	1.51	
Crete	90	36	62.3	3.85	
Culbertson	......	......	......	1.97	
Curtis *a* †	95	32	63.9	1.67	
Curtis *b*	......	......	......	1.35	
David City *†[1]	85	35	58.8	4.25	
Divide	......	......	......	2.52	
Dunning	......	......	......	0.72	
Edgar *[1]	92	37	61.9	4.14	
Elba	......	......	......	3.06	
Ericson *†[1]	85	32	61.3	2.63	
Ewing	......	......	......	1.96	
Fairbury †	89	35	61.9	3.22	
Fairmont †	95	33	60.6	4.26	
Filley	......	......	......	2.38	
Fort Robinson	90	31	58.6	2.20	
Franklin	98	34[e]	60.3[e]	2.00	
Fremont	85	32	59.3	5.03	
Geneva †	91	34	60.8	4.11	
Genoa	93	32	61.1	2.40	
Gering †	95	26	59.3	1.89	
Gothenburg	94	29	60.1	1.84	
Grand Island *a*	......	......	......	2.05	
Greeley	......	......	......	1.30	
Haigler	......	......	......	0.85	
Hartington †	90	27	57.5	1.81	
Harvard *[1]	92	34	59.8	3.04	
Hastings *[1]	90	32	58.9	2.52	
Hay Springs †	89[d]	26[d]	55.3[d]	1.73	T.
Hebron †	90	31	60.5	3.21	
Hickman	......	......	......	3.74	
Holdrege *a*	......	......	......	2.36	
Holdrege *b* *[1]	94	38	60.7	2.75	
Indianola *[5]	94	31	57.8	1.54	
Indianola (near)	......	......	......	2.27	
Kearney	......	......	......	1.98	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Nebraska—Cont'd.					
Kennedy †	......	......	......	2.76	
Kimball †	89	31	59.4	1.66	
Kirkwood *[1]	92	38	57.3	3.24	
Lexington †	91	26	59.4	3.02	
Lincoln *b*	88	35	61.3	5.03	
Lincoln *d*	93	36	62.4	3.48	
Lodgepole †	92	28	58.6	1.32	
Loup *a*	90	40	61.2	1.88	
Loup *b* *[1]	92	32	59.4	2.98	
Lynch *†[1]	99	28	59.3	2.17	
Lyons	......	......	......	3.86	
McCook *[1]	96	38	65.2	1.68	
McCool	......	......	......	3.71	
Madison *[1]	91	28	58.6	2.43	
Madrid *†[5]	98	32	59.6	0.95	
Marquette	......	......	......	2.22	
Milford	......	......	......	4.53	
Minden *a* *[1]	92	30	59.2	2.63	
Minden *b*	......	......	......	2.71	
Nebraska City *a* †	93[d]	31[e]	59.8[d]	3.49	
Nebraska City *b* *[1]	88	35	64.3	3.46	
Nemaha *[1]	90	30	60.4	5.60	
Nesbit †	91	27	58.8	1.97	
Norfolk †	87	31	60.0	2.25	
Norman	102	34	64.6	2.56	
North Loup †	95	28	59.6	2.44	
Oakdale †	91	29	58.6	1.76	
Odell *[5]	90	34	66.7	2.37	
O'Neill †	92	28	58.5	3.41	
Ord	93	28	58.9	1.96	
Osceola	......	......	......	2.78	
Ough †	......	......	......	0.99	
Palmer *a* *[1]	94	32	59.3	2.05	
Palmer *b*	......	......	......	2.65	
Plattsmouth *a* †	......	......	......	4.14	
Ravenna *a*	94	30	60.7	3.25	
Ravenna *b* *[1]	94	38	59.4	1.71	
Redcloud *a*	......	......	......	2.39	
Redcloud *b* *[1]	93	30	60.1	2.60	
Republican *[1]	88	36	61.6	1.50	
Rulo *[1]	92	38	64.0	5.85	
St. Libory	94	34	62.0	2.58	
St. Paul	93	35	63.4	2.96	
Salem *[1]	90	34	62.8	4.92	
Santee Agency †	96	28	61.6	2.40	
Sargent	......	......	......	2.25	
Schuyler	......	......	......	2.76	
Seneca *[1][e]	90	30	57.6	1.48	
Seward *[5]	87	38	61.9	4.74	
Springview	94	16	56.9	2.10	
Stanton *[1]	87	33	60.3	2.78	
Stockham	......	......	......	1.90	
Strang *[1]	91	38	64.2	5.90	
Stratton	......	......	......	1.20	
Stromsburg	......	......	......	2.68	
Superior *[5]	94	38	63.2	4.88	
Sutton	93	35	60.0	4.90	
Syracuse	......	......	......	2.79	
Tecumseh *a* †	94	28	61.5	3.41	
Tecumseh *b* †	95	29	61.4	3.24	
Tekamah	87	30	59.4	4.62	
Thedford *[1]	96	24	56.9	1.60	
Turlington †	91	34	60.8	4.09	
Valentine †	91	27	57.4	2.73	
Wakefield	......	......	......	2.42	
Wallace *[1]	90	27	62.8	0.96	
Weeping Water *[1]	88	30	57.8	4.16	
Whitman	......	......	......	1.30	
Wilber *[1]	90	38	63.4	4.98	
Wilsonville *[1]	94	32	62.6	2.07	
Wisner	......	......	......	3.90	
Woodlawn	......	......	......	3.98	
York *[1]	92	32	62.2	4.12	
Nevada.					
Austin	80	34	57.8	0.39	
Battle Mountain *[1]	88	40	59.3	0.00	
Belmont	79	32	57.4	0.05	
Beowawe *[1]	96	38	60.8	0.25	
Candelaria	92[e]	40[e]	66.9[e]	0.16	
Carlin *[1]	94	28	53.5	T.	
Carson City	86	32	57.7	0.38	
Cloverdale *[1]	85	40	64.8	T.	
Cranes Ranch	......	......	......	0.23	
Duckwater	88	35	64.8	0.14	
Elko *[8]	94	35	55.6	0.25	
Ely	82	23	53.3	0.30	
Empire Ranch †	90	29	59.2	0.04	
Fenelon *[1]	94	25	53.3	0.53	
Golconda *[8]	90	40	60.9	0.00	
Halleck *[1]	95	23	52.6	0.22	
Hawthorne *a* *[8]	86	48	66.2	0.05	
Hawthorne *b*	88	39	64.0	0.05	
Hot Springs *[8]	90	50	68.2	......	
Humboldt *[1]	86	38	63.8	0.21	
Knickerbocker Mills	85	35	59.8	0.12	T.
Lewers Ranch	84	36	58.4	0.68	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Nevada—Cont'd.					
Los Vegas	91	47	68.0	T.	
Lovelock *[8]	89	50	65.1	0.00	
Mill City *[1]	92	42	58.9	0.00	
Osceola	87	39	63.9	0.15	
Palisade *[1]	92	31	64.8	0.10	
Palmetto	85	25	57.4	1.15	
Reno *[8]	92	42	63.4	......	
Reno State University	86	37	58.9	0.93	
St. Clair	84	37	59.7	0.29	
St. Thomas	102	34	76.4	0.00	
San Antonio	85[i]	36	61.0[e]	0.95	
Sodaville	93	34	65.2	0.10	
Stofiel [f]	89	15	50.7	0.55	
Tecoma *[1]	93	38	58.3	0.20	
Toano *[1]	90	35	57.4	0.25	
Tybo	85	33	58.7	0.05	
Verdi *[1]	85	45	59.8	1.00	
Wadsworth *[1]	88	36	54.8	0.41	
Wells	88	19	55.8	0.36	
New Hampshire.					
Alstead *[6]	82	36	57.6	5.60	
Belmont	......	......	......	5.44	
Berlin Mills	89	23	52.2	2.73	
Bethlehem	85	28	55.6	2.98	
Brookline *[1]	82	36	59.6	6.71	
Concord	87	33	58.4	4.92	
Durham	88	32	58.8	9.48	
Grafton †	90	28	54.8	5.04	
Hanover	86	32	57.8	5.36	
Keene	87	29	57.7	5.51	
Lakeport	......	......	......	4.59	
Lancaster	86	28	55.6	3.86	
Nashua	90	32	59.7	5.88	
Newton †	86	32	58.6	7.09	
North Conway	90	30	57.0	5.97	
Peterboro	88	27	57.1	5.31	
Plymouth	90	29	56.7	5.55	
Sanbornton †	86	29	55.8	5.01	
Stratford	96	29	57.4	4.01	
Warner	......	......	......	5.33	
Weirs Bridge	......	......	......	5.46	
West Milan	89	26	54.4	3.74	
Wolfboro	......	......	......	5.39	
New Jersey.					
Allaire	90	32	64.6	......	
Asbury Park	84	38	64.4	2.98	
Barnegat	93	36	66.2	2.28	
Bayonne	91	41	66.5	4.48	
Belvidere	95	34	64.8	3.88	
Beverly †	94	35	66.8	2.84	
Billingsport *[1]	90	42	66.3	4.16	
Blairstown	91	37	62.5	4.74	
Boonton	94	37	63.7	6.25	
Bridgeton	93	42	68.2	4.01	
Camden	89	39	65.8	2.71	
Cape May	86	42	67.9	3.19	
Cape May C. H. †	90	39	67.0	2.70	
Charlotteburg	90	32	60.7	8.77	
Chester	85	36	61.4	7.35	
College Farm †	91	37	65.6	4.81	
Deckertown	90	37	62.6	5.12	
Dover	93	34	62.7	8.07	
Egg Harbor City	93[e]	34[e]	63.6[e]	3.18	
Elizabeth †	90	37	65.2	4.26	
Englewood	90	33	64.0	3.46	
Franklin Furnace	88	32	62.0	5.89	
Freehold	86	37	63.9	4.02	
Friesburg	......	......	......	3.44	
Gillette	90[j]	33[k]	60.9[j]	4.96[e]	
Hanover	85	37	62.0	4.17	
Hightstown	92	38	65.5	4.65	
Imlaystown	94	38	66.4	3.78	
Junction	......	......	......	6.98	
Lambertville	90	36	65.8	6.04	
Linwood [f]	89	36	65.6	2.21	
Millville	95	32	66.0	2.43	
Moorestown	93	37	67.2	4.15	
Newark *a*	86	43	66.1	4.08	
Newark *b* †	90	43	65.8	4.18	
New Brunswick *a*	92	38	67.3	5.02	
New Brunswick *b* [e]	88	38	63.6	3.84	
Ocean City	87	43	67.6	2.52	
Oceanic	92	43	67.0	4.71	
Paterson	90	40	64.8	4.36	
Perth Amboy	89	39	65.0	5.07	
Plainfield	91	37	65.1	5.72	
Rancocas	......	......	......	3.84	
Readington *[1][e]	92	40	69.0	......	
Rivervale	91	33	62.0	4.57	
Sergeantsville *[1]	94	39	64.6	6.09	
Somerville	95	33	65.4	4.67	
South Orange	86	37	64.1	4.90	
Toms River	95	32	65.2	3.79	
Trenton	92	44	68.0	4.12	
Vineland	94	33	66.7	2.87	
Woodbine	91	30	63.8	2.63	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico.	°	°	°	*Ins.*	*Ins.*
Albert†	95	45	69.3	4.40	
Albuquerque†	89	41	68.2	0.72	
Alma†	91	41	68.4	1.24	
Aztec†	90	34	64.4	1.32	
Bernalillo†	95	31	64.1	1.37	
Bluewater†	84	27	57.2	2.25	
Buckman†	81	20	53.6	1.28	
Chama†	88	26	59.4	1.80	
Deming*[8]	96	59	75.5	2.00	
East Lasvegas†	84	34	61.0	4.38	
Eddy†	99	42	73.8	2.87	
Engle†	93	43	70.2	1.10	
Espanola†	91	35	65.5	1.18	
Fort Bayard	88	43	67.1	2.35	
Fort Wingate	92	33	63.9	1.17	
Galisteo†	87	40	66.0	1.19	
Gallinas Spring†	90	36	65.4	2.69	
Gila	94	44	72.4	2.18	
Hillsboro†	91	44	67.0	2.06	
Labelle†	79	22	50.9	1.36	
Las Cruces†	96	44	70.7	1.24	
Lordsburg*[8]	88	55	71.5	1.51	
Los Lunas†	92	40	64.9	1.55	
Lower Penasco†	88	35	65.8	1.57	
Monero†	82	24	56.2	1.15	
Ocate†	85	32	58.6	3.71	
Puerto de Luna†	95	39	69.7	2.00	
Raton	91	29	63.8	1.14	
Rincon†	98	48	72.8	......	
Roswell†	98	37	70.8	1.98	
San Marcial†	93	44	70.4	0.95	
Shattucks Ranch	88	35	62.2	4.25	
Socorro†	88	44	67.8	1.35	
Springer†	92	30	62.5	......	
Valley Ranch	90	30	60.8	3.00	
White Oaks†	87	35	64.4	1.17	
Winsors Ranch	......	......	......	3.40	
New York.					
Adams	......	......	......	3.36	
Addison	90	32	59.7	3.67	
Akron	......	......	......	6.03	
Alfred	89	28	57.5	5.04	
Angelica†	88	27	56.9	4.96	
Appleton	88	36	58.8	4.17	
Arcade	86	27	56.9	6.18	
Atlanta	......	......	......	2.66	
Avon	90	28	58.8	3.82	
Baldwinsville	89	36	60.3	5.63	
Bedford	86	33	61.7	5.69	
Big Sandy*[10]	85	30	58.9	......	
Binghamton†	94	33	60.4	4.62	
Bloomville	95	33	61.4	4.06	
Boyds Corners	......	......	......	6.54	
Brentwood	87	30	62.2	......	
Brookfield	93	34	56.7	1.97	
Brooklyn	84	45	65.6	4.49	
Canton†	86	25	56.2	5.46	
Carmel	90	34	62.2	5.18	
Catskill	89	40	62.2	5.24	
Charlotte*[10]	84	40	57.3	......	
Cherry Creek	......	......	......	4.64	
Cooperstown†	85	31	56.5	4.33	
Cortland	91	30	59.3	3.70	
De Kalb Junction	......	......	......	5.61	
Demster	......	......	......	4.31	
Dryden	90	33	60.2	......	
Eagle Mills	......	......	......	4.04	
Easton	......	......	......	5.30	
Elka Park	82	29	56.8	7.42	
Elmira†	91	35	61.8	2.73	
Fleming	91	36	60.8	4.93	
Fort Niagara†	91	44	60.8	3.71	
Friendship	90	28	58.2	5.65	
Fulton	......	......	......	5.88	
Glens Falls	89	32	58.8	4.81	
Gloversville	90	32	58.2	6.21	
Haskinsville	......	......	......	4.84	
Honeymead Brook	85	33	59.7	7.21	
Humphrey†	90	29	57.4	5.05	
Ithaca	91	37	60.6	3.84	
Jamestown	86	36	58.8	5.48	
Kings Station	......	......	......	6.79	
Lebanon Springs	87	31	58.3	5.83	
Lockport	87	30	60.0	4.45	
Lowville	87	27	56.4	3.09	
Lyons	90	40	60.3	3.72	
Madison Barracks†	87[f]	35	58.4[e]	5.84	
Manhattan Beach†	85	44	63.6	4.37	
Mohonk Lake	85	38[e]	60.8[e]	6.64	
Mount Morris	92	26	60.4	3.94	
Newark Valley	......	......	......	3.24	
New Lisbon	89	27	56.2	5.07	
Niagara Falls	......	......	......	3.98	
North Hammond†	88	32	58.8	4.50	
North Lake	87	27	54.6	5.59	
Number Four†	85	25	54.3	5.01	
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Oneonta	90	34	60.6	3.13	
Oxford	92	28	58.2	2.15	
Palermo	93	40	59.6	2.51	
Perry City	91	33	57.0	3.97	
Pine City	......	......	......	3.35	
Pittsford	90	31	58.6	3.73	
Plattsburg Barracks†	85	34	57.1	2.85	
Port Jervis	89	36	61.4	5.43	
Potsdam	85	28	57.3	5.10	
Poughkeepsie	92	33	60.7	5.70	
Ridgeway	......	......	......	4.13	
Rome	85	30	58.9	4.57	
Romulus	92	36	61.2	5.10	
Rose†	......	......	......	4.59	
Saranac Lake	86	27	55.3	4.75	
Scottsville	......	......	......	3.36	
Setauket†	84	42	63.9	3.62	
Sherwood	......	......	......	4.33	
Skaneateles	......	......	......	5.08	
South Canisteo	90	27	58.0	5.10	
Southeast Reservoir	......	......	......	5.17	
South Kortright†	88	28	57.1	3.68	
Tyrone	......	......	......	3.78	
Varysburg	91	26	59.0	5.15	
Wappingers Falls	87	37	60.6	7.01	
Warwick	......	......	......	8.12	
Watertown	88	26	58.1	4.43	
Waverly†	97	30	61.6	3.57	
Wedgwood	95	31	60.8	5.02	
Westfield	87	36	60.0	4.73	
Westpoint†	90	42	63.0	5.74	
Willetspoint	83	43	64.8	5.68	
North Carolina.					
Asheville†	93	35	66.6	3.87	
Beaufort†	88	50	74.7	5.44	
Biltmore†	94	33	66.4	2.97	
Bryson City†	......	......	......	3.70	
Chapelhill†	99	40	71.6	8.39	
Edenton†	91	42	71.2	5.91	
Experimental Farm	98	45	72.6	3.44	
Fairbluff†	......	......	......	6.26	
Falkland*[1]	98	50	75.0	5.52	
Fayetteville†	97	39	72.3	9.01	
Flatrock	86	31	64.7	6.70	
Goldsboro†	98	41	72.8	4.38	
Greensboro†	101	40	72.6	7.73	
Greenville	......	......	......	3.35	
Henderson†	101	42	71.8	4.42	
Highlands	84	31	61.1	4.96	
Horse Cove†	88	37	67.3	4.02	
Jacksonville†	96	39	73.6	4.04	
Jefferson†	88	31	61.7	8.00	
Lenoir*†[1]	86	42	66.7	5.74	
Linville†	80	30	58.6	9.38	
Littleton†	95	39	69.2	5.93	
Louisburg†	100	38	71.2	3.15	
Lumberton†	94	42	73.5	5.41	
Lynn*†[2]	92	......	66.8	3.34	
Marion	98	39	69.2	3.43	
Mocksville†	97	42	71.6	5.09	
Moncure†	98	36	70.6	6.78	
Monroe	100	37	73.0	......	
Morganton*†[1]	97	45	68.9	7.44	
Mountairy†	93	34	67.2	7.91	
Mount Pleasant	98	38	72.5	3.88	
Murphy†	......	......	......	3.55	
Newbern†	92	48	74.2	4.37	
Oakridge†	95	39	69.0	9.57	
Pantego	......	......	......	5.30	
Pittsboro†	95	38	69.9	6.15	
Raleigh*[1]	96	44	73.7	3.75	
Rockingham†	100	42	75.0	6.36	
Roxboro†	98[g]	36[g]	69.9[g]	5.79	
Salem†	97	38	70.8	5.79	
Salisbury†	99	41	71.6	5.63	
Saxon†	99	35	70.6	8.80	
Selma	101	39	71.2	1.80	
Settle	98	41	71.8	6.93	
Skyuka	86	42	63.4	4.45	
Sloan†	95	38	73.2	3.82	
Soapstone Mount†	98	32	67.9	8.11	
Southern Pines	102	40	74.8	5.00	
Southport†	91	45	75.4	2.99	
Springhope*[1]	94	41	70.0	6.50	
Tarboro	101	36	71.9	6.20	
Waynesville†	88	33	64.4	4.14	
Weldon†	96	37	69.4	6.48	
Willeyton	94	39	69.9	5.47	
North Dakota.					
Amenia	95[d]	26[d]	54.0[d]	2.99	
Ashley†	96	......	......	0.75	
Bottineau†	79	26	52.0	2.06	
Buxton	87	23	53.4	1.27	
Churchs Ferry	87	22	52.4	2.32	
Coalharbor†	86	22	52.5	1.71	
Dickinson†	90	14	51.7	0.30	
North Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ellendale	97	21	53.9	1.28	
Falconer	92	19	51.6	1.39	
Fargo†	94	28	53.8	2.58	
Forman†	96	20	55.8	1.12	
Fort Berthold†	93	27	57.4	0.12	
Fort Yates†	98	22	55.8	3.15	
Gallatin†	95	19	52.9	3.59	
Grafton†	82	21	51.8	0.95	
Jamestown†	89	29	55.1	3.08	
McKinney	84	20	50.1	0.97	
Mayville	88	26	53.4	2.91	
Medora†	92	22	53.0	0.27	
Milton†[c]	88	20	49.8	1.55	
Minto†	85	22	53.3	1.08	
Napoleon†	92	25	53.4	2.56	
New England City†	88	23	56.3	0.20	
Oakdale†	81	25	52.9	1.40	
Portal†	88	22	50.2	0.81	
Power†	93	23	55.4	3.38	
St. John†[b]	79	25	48.6	2.91	
Sheyenne	88	21	53.3	2.35	T.
Steele	91[c]	22[c]	51.1[c]	2.26	
Towner†	82	21	51.2	1.92	
University†	86	22	53.6	1.39	
Valley City†	90	......	......	3.32	
Wahpeton†	93	27	56.1	2.69	
Wildrice†[2]	......	......	51.0	2.61	
Willow City†	87	11	52.0	2.20	
Woodbridge†	81	21	49.8	2.74	
Ohio.					
Akron	88	39	61.3	4.75	
Annapolis	94	30	61.6	4.67	
Ashland	88	35	59.4	6.21	
Ashtabula	88	40	61.5	4.82	
Atwater	......	......	......	5.00	
Auburn	90	33	59.0	4.46	
Bangorville	88	33	60.9	5.97	
Basil	......	......	......	6.96	
Bellefontaine	95	30	62.9	7.33	
Bement	......	......	......	3.97	
Benton Ridge	95	28	61.8	4.55	
Berlin Heights	91	34	61.0	4.98	
Bethany	97	35	65.8	5.89	
Bigprairie	89	35	60.5	5.69	
Binola	93	39	64.0	4.37	
Bissells	......	......	......	4.20	
Bladensburg	90	30	60.8	5.20	
Bloomingburg	91	32	62.6	5.58	
Bowling Green	90	26	60.6	3.99	
Cambridge	90	31	61.4	5.18	
Camp Dennison	93	35	65.2	3.35	
Canal Dover	91	31	62.6	3.35	
Canfield	......	......	......	4.50	
Canton†	90	34	62.0	6.24	
Carrollton	92	32	60.4	4.35	
Cedarville	90	42	65.2	6.64	
Celina	90	37	63.9	5.01	
Cherryfork	98	27	66.2	3.12	
Circleville *b*	93	34	65.2	5.28	
Clarksville	93	32	63.8	4.40	
Cleveland	87	42	61.6	4.19	
Clifton	96	29	63.0	6.14	
Coalton	94	27	63.8	5.38	
Colebrook	89	33	60.4	6.08	
Dayton *a*	94	34	64.4	6.02	
Dayton *b*†	......	......	......	4.71	
Defiance	92	27	61.2	2.93	
Delaware†	91	31	62.2	5.56	
Demos	85	39	62.8	3.92	
Dupont	88	29	57.5	3.17	
Elyria	92	39	61.7	4.59	
Fairport Harbor*[10]	86	46	63.3	......	
Fayetteville	91	31	63.9	4.33	
Findlay	94	27	61.2	5.01	
Frankfort	91	32	62.8	5.62	
Garrettsville†	96	31	60.2	5.03	
Granville	92	30	61.6	6.64	
Gratiot	89	34	61.8	6.54	
Greenfield	91	36	64.8	4.52	
Greenhill	93	30	61.3	4.41	
Greenville	85	33	60.8	5.82	
Hackney	90	33	62.3	5.96	
Hanging Rock	95	35	66.4	4.12	
Hedges	89	25	59.8	3.26	
Hillhouse	90	35	60.2	5.19	
Hillsboro†	99	30	64.6	4.38	
Hiram	89	36	60.2	4.69	
Jacksonboro	97	34	64.8	6.60	
Kenton†	90	30	62.3	5.04	
Killbuck	92	30	60.7	5.15	
Lancaster	89	32	61.2	7.33	
Leipsic	89	25	59.9	4.80	
Levering	92	24	58.2	6.95	
Logan	96	31	63.0	5.35	
Lordstown	90	34	62.2	3.99	
McArthur	94	30	64.2	4.49	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Ohio—Cont'd.					
McConnelsville †	96	33	64.4	3.79	
Marietta *a* †				3.02	
Marion	94	29	62.0	6.47	
Medina	92	35	61.6	4.37	
Milfordton	91	31	60.5	6.15	
Milligan	97	35	65.4	4.77	
Millport	88	42	65.4	3.60	
Montpelier	87	28	59.4	5.15	
Napoleon	90	28	59.4	4.77	
New Alexandria	86	34	62.6	4.11	
New Berlin	94	35	60.4	4.85	
New Bremen	90	28	61.0	5.75	
New Comerstown	92	32	61.8	5.61	
New Holland	96	32	64.2	4.60	
New Moscow				5.78	
New Paris	99	33	65.2	6.85	
New Waterford	90	36	61.6	4.46	
North Lewisburg	92	32	62.2	7.00	
North Royalton	93	37	63.0	5.40	
Norwalk	91	23	57.8	4.65	
Ohio State University	93	31	62.2	6.57	
Orangeville	89	30	60.0	3.60	
Ottawa	89	30	62.0	4.47	
Pataskala †	94	31	62.8	8.11	
Peoli	90	33	63.7	4.81	
Perry	85	44	64.4	4.64	
Philo	94	36	63.7	4.76	
Plattsburg	94	30	63.2	6.53	
Pomeroy	91	36	65.8	2.49	
Portsmouth *a* †				3.87	
Portsmouth *b*	93	35	66.0	4.19	
Richwood				5.18	
Ridgeville Corners	89	26	59.7	3.90	
Ripley	91	34	64.9	3.34	
Rittman	90	31	59.1	5.84	
Rockyridge	94	30	62.4	4.89	
Rosewood	86	30	60.4	7.61	
Sharon Center				4.84	
Shenandoah	91	29	60.0	5.03	
Sidney *b*	92	32	62.2	6.20	
Sinking Spring †	90	35	64.0	3.33	
Springboro				6.33	
Spring Valley	93	30	63.2	6.38	
Strongsville				5.97	
Sylvania	90	25	59.3	2.76	
Thurman	98	33	68.2	3.85	
Tiffin †	88	34	61.3	4.73	
Upper Sandusky				4.47	
Urbana	85	33	60.8	7.39	
Vanceburg	92	32	65.5	3.96	
Van Wert	90	29	60.4	4.71	
Vermilion	88	37	60.1	4.41	
Vickery	93	31	61.4	4.60	
Walnut				5.29	
Warren	91	33	60.8	3.81	
Warsaw	96	31	63.9	4.05	
Wauseon	90	26	60.8	4.58	
Waverly	97	33	66.8	3.99	
Waynesville	95	34	60.3	5.65	
Westerville	87	35	61.5	6.33	
Willoughby				4.03	
Wooster *a*	92	34	60.6	5.16	
Youngstown	90	34	58.8	4.56	
Oklahoma.					
Alva †	100	32	69.2	2.80	
Anadarko †	107	34	75.1	1.85	
Arapaho †	103	35	71.6	2.36	
Beaver †	104c	29c	69.3c	2.10	
Buffalo †	99	40	71.8	3.72	
Burnett †	104	35	72.6	2.04	
Clifton †	106	36	74.1	2.51	
Edmond				2.51	
Fort Reno †	102	37	72.6	1.85	
Fort Sill	103	40	73.7	0.81	
Guthrie †	103	38	73.2	2.50	
Hennessey †	102	47j	72.7c	1.49	
Keokuk Falls †	102			2.10	
Mangum †	104	35	74.2	1.34	
Norman †	104	33	74.2	1.90	
Pondcreek †	107	34	72.8	4.17	
Prudence †	106	38	73.5	3.56	
Sac and Fox Agency † f	104	32	71.0	2.10	
Stillwater †	103	36	72.0	2.54	
Winnview †	104	37	70.7	2.46	
Oregon.					
Arlington †	85	36	62.6	0.06	
Ashland *b*	96	30	60.5	0.81	
Aurora *[8]	95	42	63.6	0.56	
Aurora (near)	92	36	58.8	0.48	
Bandon	72	40	55.0	0.52	
Bay City †	90	40	57.0	2.18	
Beulah	82	25	52.1	0.51	
Brownsville *[8]	94	40	63.5	0.53	
Burns †	91	22	53.2	0.70	
Cascade Locks	88	42	61.4	1.66	
Comstock *[8]	90	32	56.5	0.68	
Oregon—Cont'd.					
Corvallis *a*	94	32	58.6	0.41	
Dayville †	91	28	58.8	0.30	
Detroit †	91	31	57.8	1.08	
Eugene † *a*	89	38	60.2	0.66	
Falls City				0.78	
Fife †	88	25	53.0	0.30	
Forest Grove	94	30	60.0	0.62	
Fort Klamath	86	21	51.6	0.18	
Gardiner	81	43	59.0	0.82	
Glenora	96	30	57.2	2.78	
Government Camp	82	26	50.6	1.95	
Grants Pass *a* †	98	32	60.6	0.78	
Happy Valley †	87	20	51.8	0.71	
Hood River (near)	86	38	59.5	0.98	
Hubbard	92	30	58.2	1.10	
Irvington				0.49	
Jacksonville	92	32	60.2	1.01	
Joseph †	82	30	52.2	0.39	
Junction City *[8]	94	38	61.0	1.36	
Lafayette *[8]	96	40	62.9	0.40	
Lakeview †	87	30	55.1	1.17	
Langlois	90	43	61.6	0.80	
Lorella	90	28	59.6	0.75	
McMinnville *a* †	94	31	59.4	0.78	
Merlin *[8]	105	34	62.4	0.70	
Monmouth *[8]	95	40	62.9	0.43	
Mount Angel †	95	35	62.1	0.99	
Nehalem				5.13	
Newberg	94	34	60.8	0.47	
Newbridge	94	33	60.5	T.	
Oakhurst				0.78	
Pendleton	94	28	58.9	0.26	
Riddles *[8]	90	30	57.0	1.60	
Salem *b* †	91	35	60.2	0.66	
Sheridan *[8]	95	42	62.7	0.67	
Silver Lake	92	14	51.2	0.18	
Silverton *[8]	94	40	59.8	0.66	
Siskiyou *[8]	90	43	59.5		
Sparta	89	29	55.6	0.35	
Stafford	94	37	61.0	0.52	
The Dalles †	92	35	62.6	0.42	
Tillamook Rock L H †				1.59	
Toledo	89	31	57.7	0.64	
Umatilla †				0.10	
Vale	90	25	56.6	0.16	
West Fork *[8]	96	40	59.3	0.88	
Weston	90	29	56.3	0.43	
Williams	93	29	57.8	0.84	
Pennsylvania.					
Altoona	90	38	64.7	6.03	
Aqueduct	97	35	65.6	2.59	
Bethlehem				3.68	
Blooming Grove	90	34	59.0	6.03	
Brookville †				5.55	
Browers Lock				8.57	
Cameron				6.23	
Canonsburg	92	39	66.1	1.73	
Carlisle	97	36	65.6	2.75	
Cassandra	90	35	62.2	6.77	
Cedarrun				4.98	
Centerhall †	93	36	62.7	6.23	
Chambersburg †	95	33	63.6	2.52	
Coatesville	93	35	65.5	8.31	
Confluence †	90	39	65.0	6.77	
Coopersburg	91	41	66.0	6.08	
Davis Island Dam †				3.80	
Doylestown				5.89	
Drifton *	88	33	60.5		
Driftwood				7.43	
Dubois †				5.21	
Duncannon				2.69	
Dyberry †	91	31	59.3	4.10	
East Bloomsburg				3.23	
East Mauch Chunk	94	33	63.2	6.31	
Easton	86	37	64.2	4.49	
Edinboro *[1]	83	36	58.2		
Ellwood Junction †				2.89	
Emporium	87	33	61.1	5.69	
Farrandsville				4.58	
Forks of Neshaminy *[1]	86	42	65.0	8.49	
Frederick				5.18	
Freeport †				4.73	
Girardville				3.26	
Grampian	90	34	61.0	4.45	
Greensboro †	93	33	65.1	4.19	
Hamburg	95	36	66.2	4.84	
Hollidaysburg	95	32	63.4	6.33	
Honesdale				4.88	
Huntingdon *a* †	95	38	63.8	6.98	
Huntingdon *b*				7.42	
Indiana	89	33	63.2	5.75	
Irwin	98	41	71.6	4.12	
Johnstown †				6.08	
Karthaus				2.89	
Keating				6.21	
Kennett Square	92	34	65.4	6.23	
Pennsylvania—Cont'd.					
Lancaster	92	37	69.1		
Lansdale				3.97	
Lebanon	95	36	65.4	2.92	
Leroy †	92	33	60.8	3.87	
Lewisburg	95	34	63.8	3.66	
Lock Haven *a* †	96	35	64.4	5.80	
Lock Haven *b*				5.46	
Lock No. 4 †				4.57	
Lycippus				4.59	
Mifflin				4.28	
Oil City †				4.40	
Ottsville				6.95	
Parker †				4.24	
Philadelphia *b*	91	43	67.4	4.02	
Point Pleasant				3.24	
Pottstown	92	36	66.0	6.33	
Quakertown	93	34	63.6	7.11	
Reading [2]			63.4	3.66	
Renovo *a*				5.59	
Renovo *b*	92	35	62.2	5.49	
Ridgway †				5.44	
Saegerstown	91	29	59.4	4.31	
St. Marys	89	32	60.0	5.15	
Salem Corners	91	31	62.0	4.64	
Scranton	95	33	62.8	2.33	
Seisholtzville				5.18	
Selinsgrove	94	32	63.6	3.81	
Shawmont				4.71	
Shinglehouse	90	26	59.0	6.83	
Sinnamahoning				4.10	
Smethport	90	30	58.6	6.82	
Smiths Corners				6.09	
Somerset	92			6.50	
South Bethlehem *[1]	85	45	66.4		
South Eaton	90	33	61.8	2.45	
State College	91	35	62.1	5.02	
Sunbury				2.53	
Swarthmore	87	41	65.4	5.35	
Towanda	94	31	61.2	2.73	
Uniontown	89	38	64.2	3.78	
Warren †	90	32	60.2	6.08	
Wellsboro * † [1]	90	28	55.9	3.03	
West Chester	91	40	65.9	6.91	
West Newton †				4.41	
Westtown	89	35	64.7	6.97	
White Haven *[1]	94	40	64.4	3.71	
Wilkesbarre †	95	34	63.6	2.26	
Williamsport	90	35	62.6	3.81	
York †	94	35	65.4	2.54	
Rhode Island.					
Bristol	81	42	61.5	7.34	
Kingston	84	33	60.7	7.44	
Lonsdale				8.27	
Pawtucket	85	40	62.1	7.81	
Providence *a*	82	40	62.8	8.53	
Providence *c*	86	38	61.7	8.66	
South Carolina.					
Allendale †	100	39	75.0	2.53	
Anderson †				2.91	
Batesburg †	99	44	75.0	2.20	
Blackville †	100	42	76.0	1.12	
Camden †				2.52	
Central †	98	42	73.6	8.06	
Cheraw *a* †	94	40	72.8	5.39	
Cheraw *b* †				6.11	
Clemson College	98	40	74.5	9.21	
Conway †				3.33	
Darlington (near)				2.49	
Edisto †				3.68	
Effingham †				1.70	
Florence †	99	39	73.2	2.35	
Georgetown †	90	49	73.0	2.87	
Gillisonville †	104	40	76.6		
Greenville †	96	41	71.2	3.49	
Greenwood †	95	44	73.3	0.56	
Kingstree *a* †	97	40	74.8	1.24	
Kingstree *b* †				1.24	
Little Mountain	105	45	76.7	6.74	
Longshore †	97	46	73.8	6.64	
Mount Carmel †				2.53	
Pinopolis *[1]	93	49	73.6	2.07	
Port Royal †	95	55	78.4	1.16	
St. Georges †	98	41	75.2	2.40	
St. Matthews †	98	43	75.6	2.10	
St. Stephens †				1.90	
Santuck †	99	41	73.1	6.01	
Shaws Fork *[1]	105	46	79.9	0.50	
Smiths Mills †				0.64	
Society Hill †	96	44	73.4	4.26	
Spartanburg †	102	45	75.0	3.77	
Statesburg †	98	46	76.2	2.18	
Trenton	98c	53c	79.6c	3.60	
Trial †	101	40	75.4	1.73	
Walhalla †	94	44	71.2	5.35	
Winnsboro	96	41	73.0	1.73	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Yemassee†	101	43	76.4	1.77	
Yorkville	99	46	74.4	5.73	
South Dakota.					
Aberdeen†	96	22	56.4	2.76	
Alexandria†	95	25	58.4	3.83	
Armour†	95	26	58.0	3.04	
Ashcroft†	91	20	54.4	2.41	
Brookings*[1]	88	16	55.1	1.90	
Canton†[1]	86	27[a]	56.6	4.16	
Castlewood†	......	......	......	4.42	
Chamberlain†	98	26	60.7	1.60	
Clark†	92	24	56.8	1.76	
Cross†	86	22	51.8	2.78	0.2
Edgemont	......	......	......	0.45	
Farmingdale	......	......	......	2.39	
Faulkton *a*†	97	22	56.0	1.40	
Faulkton *b*†	96	23	54.0	1.48	
Flandreau†	90	26	57.0	3.23	
Forestburg†	95	22	58.9	1.49	
Forest City†	98	23	58.4	0.52	
Fort Meade†	91	35	58.0	2.46	
Gary†	92	27	57.2	3.38	
Goudyville*†[1]	97	24	55.0	0.88	
Greenwood†	97	31	61.2	2.28	
Hotch City†	98	20	58.2	1.42	
Howard†	93	26	58.2	5.48	
Kimball†	94	22	58.6	1.81	
Leslie†	97	20	58.7	0.85	
Mellette†	100	27	60.7	0.95	
Menno†	95	29	60.7	2.82	
Mitchell†	93	22	56.2	2.63	
Nowlin†	102	22	58.2	0.15	
Oelrichs†	92	28	55.0	0.80	
Parker†	89	27	58.0	4.24	
Parkston†	94	23	56.9	2.37	
Plankinton†	94	24	58.0	2.05	
Rosebud†	97[b]	22[b]	58.3[b]	2.98	
St. Lawrence†	98	24	59.4	1.85	
Shiloh†	85	15	55.8	0.82	
Silver City	......	......	......	3.13	
Sioux Falls†	87	28	57.5	2.63	
Tyndall†	90	30	58.0	1.54	
Watertown†	80[a]	20	52.6	3.20	
Webster†	94	20	55.0	2.62	
Wentworth†	91	26	56.6	3.57	
Wessington Springs†	92	28	60.4	1.47	
Yankton†	91	31	60.6	2.03	
Tennessee.					
Andersonville*[1]	93	38	67.2	3.59	
Arlington†	98	36	70.9	2.01	
Ashwood*†[1]	98	44	71.8	3.61	
Benton (near)†	99	39	71.7	3.50	
Bolivar†	101	38	69.8	1.45	
Bristol†	89	37	66.2	3.17	
Brownsville†	98	42	71.8	6.50	
Byrdstown†	94	39	69.2	5.08	
Carthage†	......	......	......	6.06	
Clarksville	96	40	69.6	3.28	
Clinton†	......	......	......	2.25	
Cookeville	......	41	......	4.05	
Decatur†	98	39	71.2	5.47	
Dyersburg†	98	40	70.3	3.54	
Elizabethton†	95	38	71.0	4.31	
Elk Valley*[1]	88	40	67.5	3.46	
Fairmount*[1]	88	46	69.2	2.32	
Florence†	95	40	71.2	3.89	
Greeneville†	93	38	68.5	3.38	
Hohenwald*†[3]	......	34	65.5	2.49	
Jackson†	99	41	70.5	2.78	
Johnsonville†	99	36	69.8	2.54	
Jonesboro*†[1]	88	39	66.7	4.43	
Liberty†	96	45	72.0	5.59	
Loudon†	......	......	......	3.30	
Lynnville*[1]	96	42	69.6	4.68	
McKenzie*†[1]	97	43	72.0	1.90	
McMinnville†	94	42	70.0	3.48	
Milan†	98	40	72.4	2.79	
Molino†	95	43	71.8	5.48	
Newport†	95	39	70.7	2.77	
Nunnelly*[1]	97	44	69.4	2.00	
Palmetto†	99	43	73.0	5.26	
Pope*[1]	100	45	70.7	0.29	
Riddleton†	93	43	70.3	5.93	
Rockwood†	......	......	......	5.62	
Rogersville†	93	38	68.2	3.48	
Rugby*[1]	91	41	68.8	4.11	
St. Joseph†	100	34	72.4	3.13	
Sewanee†	87	40	69.0	3.11	
Springdale*[1]	96	40	70.8	2.49	
Tellico Plains†	98	39	72.3	3.81	
Trenton	97	39	68.5	2.77	
Tullahoma†	95	36	68.6	4.20	
Union City†	95	38	69.2	3.31	
Waynesboro*[1]	98	38	69.5	1.12	
Texas.					
Albany*†[1]	88	42	68.3	4.15	
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alice	105	49	79.8	2.80	
Arthur City†	......	......	......	1.14	
Austin *a*	100	44	79.6	8.24	
Austin *b**[5]	102	44	77.6	......	
Ballinger†	99	42	73.2	5.68	
Beeville†	102	48	80.7	3.14	
Blanco†	100	......	......	10.06	
Boerne*†[1]	95	47	76.5	5.59	
Brady†	101[d]	44[c]	75.8[d]	4.25	
Brazoria†	96	48	78.7	4.96	
Brenham†	102	49	79.4	4.65	
Brighton†	91	52	80.0	5.24	
Brownwood*†[1]	100	48	74.8	7.71	
Burnet*†[1]	98	52	76.3	2.06	
Chillicothe	103	38	75.2	1.75	
Coleman*[3]	......	44	71.7	5.20	
College Station	101	50	80.0	9.59	
Colmesneil	......	......	......	3.46	
Columbia†	96	46	77.0	5.41	
Corsicana *b*†	104	44	78.8	5.34	
Cuero†	100	56	80.0	3.81	
Dallas†	102	44	76.9	2.62	
Danevang†	100	46	78.8	6.72	
Dean†	96	34	67.8	3.11	
Dublin†	99	43	73.8	5.92	
Duval*[1]	106	52	80.8	6.37	
Estelle†	102	42	77.1	2.21	
Forestburg†	100	40	74.4	0.65	
Fort Brown†	99	51	80.7	4.21	
Fort Clark	102	52	79.4	4.60	
Fort McIntosh	100	52	79.6	5.52	
Fort Ringgold†	105	50	82.0	2.75	
Fort Stockton†	......	......	......	4.34	
Fort Worth†[f]	101	44	77.0	0.85	
Fredericksburg*†[1]	96[c]	44[d]	77.5[d]	7.99	
Gainesville†	103	42	77.1	2.94	
Georgetown*[1]	101	43	76.4	9.50	
Golindo	......	......	......	10.30	
Graham†	104	39	75.9	1.57	
Grapevine†	102	43	75.0	2.89	
Hale Center†	97	38	70.0	3.00	
Hallettsville†	103	46	79.8	4.67	
Haskell†	100	36	71.0	3.68	
Hearne†	101	50	78.6	8.83	
Henrietta†	105	44	77.4	0.72	
Hewitt	......	......	......	7.35	
Houston†	98	50	78.6	9.93	
Huntsville†	101	46	78.3	4.85	
Kent	......	......	......	2.05	
Kerrville†	101	39	74.4	7.30	
Lampasas†	102	41	76.4	3.73	
Leakey	......	......	......	5.80	
Llano*†[5]	102	48	78.6	2.75	
Longview†	102	45	79.1	3.30	
Lufkin†	105	44	81.6	4.49	
Luling†	102	48	79.6	5.99	
Mann†	110[i]	42[i]	77.6[i]	4.14	
Marathon†	90	51	71.0	4.96	
Menardville*†[1]	99	41	75.9[j]	4.73	
Mount Blanco†[1]	96[a]	33	71.2	0.14	
New Braunfels†	98	45	77.7	4.59	
Orange†	93	47	77.6	2.53	
Panter†	......	......	......	5.03	
Paris†	103	45	79.6	2.66	
Point Isabel*[1]	93	70	82.3	2.20	
Rheinland†	104	42	76.8	1.35	
Roby†	103[d]	40	75.9[c]	3.46	
Round Rock*†[5]	102	50	84.6	6.25	
Runge†	103	46	80.0	4.28	
San Antonio	102	47	80.0	8.81	
Sanderson	99	42	73.4	4.75	
San Marcos *a*†	......	......	......	9.78	
San Marcos *b*†	101	51	78.4	9.19	
Sherman†	99	46	77.8	2.06	
Sierra Blanca†	91	37	71.0	1.23	
Stafford†	100	45	77.6	6.89	
Sugar Land	......	......	......	7.03	
Sulphur Springs†	107	42	80.8	1.81	
Temble *a*†	102	47	77.9	4.72	
Temple *b*†	103	45	78.6	4.58	
Tyler†	99	44	75.6	2.88	
Waco†	102	48	79.3	8.48	
Waxahachie	......	......	......	4.10	
Weatherford†	100	43	76.0	1.60	
Wichita Falls†	......	......	......	0.92	
Utah.					
Alpine City†	......	......	......	0.91	
Blue Creek*[8]	95	45	65.5	0.00	
Brigham City†	......	......	......	0.81	
Cisco†	95	39	66.0	2.06	
Corinne*[1]	92	50	66.7	0.49	
Fillmore†	98	27	64.9	0.85	
Fort Duchesne†	90	31	59.6	2.23	
Giles†	96	35	65.5	2.00	
Grover†	91	27	58.6	1.17	
Heber†	88	22	54.7	1.44	
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Huntsville†	......	......	......	0.28	
Kelton*[8]	75	30	58.4	0.00	
Koosharem	85	25	55.6	0.67	
Levan†	86	27	60.8	0.54	
Loa†	85	21	55.5	0.78	
Logan†	88	36	60.7	0.91	
Mammoth†	86	37	61.8	0.19	
Manti†	100	22	61.8	0.29	
Millville†	......	......	......	1.56	
Moab†	90	39	66.0	5.97	
Mount Pleasant*†[1]	97	40	65.1	0.75	
Ogden *a**[8]	92	47	64.9	0.58	
Pahreah†	89	41	64.4	0.40	
Park City†	75	29	52.8	0.13	
Parowan†	87	31	60.7	0.47	
Promontory*[8]	90	39	65.5	T.	
St. George†	100	32	69.5	0.12	
Scipio†	88	25	61.5	0.89	
Snowville†	86	26	58.0	0.21	
Soldier Summit†	87	18	51.6	0.48	
Terrace*[8]	97	46	67.8	0.00	
Thistle†	89	28	59.4	......	
Tooele†	86	40	62.6	0.30	
Vernal†	83	33	58.4	2.48	
Vermont.					
Brattleboro	86	32	59.4	3.90	
Burlington†	88	36	60.6	3.59	
Chelsea†	86	27	54.8	4.27	
Cornwall	86	33	58.6	4.83	
Hartland†	87	29	56.2	4.92	
Jacksonville	84	29	55.3	5.10	
Norwich	89	29	56.0	4.43	
St. Johnsbury	84	31	56.3	3.24	
Strafford*†[1]	87	33	55.1	3.37	
Vernon*[6]	88	37	64.3	5.65	
Wells	85	32	57.5	6.61	
Woodstock	91	30	57.0	4.44	
Virginia.					
Alexandria*[1]	90	46	67.5	3.14	
Ashland†	95	36	67.4	5.49	
Barboursville	93	37	68.0	6.40	
Bedford City	98	......	......	6.75	
Bigstone Gap†	89	31	64.4	4.19	
Birdsnest*†[1]	95	44	71.2	3.30	
Blacksburg	92	30	62.3	4.83	
Buckingham†	98	33	67.8	4.83	
Burkes Garden	82	26	60.4	5.01	
Callaville†	92	37	69.2	3.89	
Christiansburg†	......	......	......	5.20	
Clifton Forge	92	35	66.6	6.43	
Dale Enterprise†	92	30	64.3	7.85	
Fredericksburg†	96	39	68.2	4.93	
Guinea	......	......	......	2.29	
Hampton	93	48	71.9	6.24	
Hot Springs	84	32	62.4	6.42	
Lexington†	93	33	66.8	5.88	
Manassas†	94	35	68.4	2.67	
Monterey†	82[j]	40[j]	63.2[j]	6.64	
Nottoway†	98	36	71.1	5.29	
Petersburg†	99	44	71.3	3.05	
Quantico	95	38	67.2	......	
Richmond (near)†	97	39	70.6	4.61	
Rockymount†	93	40	68.8	5.45	
Salem†	97	40	70.6	4.92	
Saltville	89	36	66.2	4.24	
Smithville†	92	......	......	4.18	
Spottsville†	95	37	69.0	4.14	
Stanardsville†	95	37	66.8	5.41	
Staunton†	94	33	66.5	8.08	
Stephens City†	94	39	67.6	5.80	
Sunbeam†	91	41	69.8	6.31	
Warsaw†	92[e]	38[e]	67.6[e]	2.99	
Westbrook Farm	94	41	69.5	......	
Woodstock	95	36	67.7	8.47	
Washington.					
Anacortes	......	......	......	1.56	
Ashford†	......	......	......	1.26	
Blaine†	79	26	52.4	1.13	
Centerville†	96	22	59.0	0.23	
Chehalis†	89	35	59.5	1.44	
Colfax†	85	29	54.0	0.49	
Connell†	92	32	61.3	......	
Coupeville†	76	38	53.8	1.11	
Eastsound†	......	......	......	1.17	
Ellensburg	84	23	56.0	0.63	
Ellensburg (near)	88	30	58.2	0.80	
Fort Simcoe†	98	34	61.8	0.12	
Fort Spokane	......	......	......	0.19	
Grandmound†	88	33	56.3	1.80	
Hunters	......	......	......	1.47	
Kennewick†	95	32	63.8	0.70	
Lakeside†	88	41	60.2	0.64	
Lapush	78	36	53.4	1.79	
Loomis†	89	37	59.0	0.88	
Madrone*†[1]	79	37	54.4	1.21	
Mayfield†	87	35	57.8	1.99	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Montecristo †	85	27	54.4	2.75	
Moxee Valley †	92	28	59.4	0.26	
New Whatcom †	77	34	56.4	1.30	
Olga †	76	38	50.0	1.08	
Olympia †	85	35	56.6	2.30	
Pine Hill †	89	33	59.7	0.64	
Pomeroy †	86	42	63.3	0.24	
Pullman †	85	30	56.4	0.43	
Queets †	86	35	55.2	2.80	
Rosalia †	84	29	55.8	0.27	
Sedro †	83	30	55.0	1.68	
Shoalwater Bay *[10]	79	45	57.8	....	
Silvercreek *[1]	86	36	54.9	1.91	
Snohomish †	83	36	56.4	2.22	
Stampede †	87	34	55.3	2.02	
Stillaguamish †	81	35	54.2	1.48	
Sunnyside †	93	32	61.4	0.40	
Tacoma †	82	37	54.8	1.74	
Union City †	85	36	56.6	1.85	
Vashon †	76	42	55.4	1.66	
Waterville †	87	28	53.9	0.89	
Wenatchee Lake †	88	26	53.2	0.40	
West Ferndale	......	......	......	1.30	
West Virginia.					
Beckley	86	42	63.0	1.59	
Beverly †	88	34	65.3	5.68	
Bloomery †	88	35	62.2	9.04	
Bluefield †	92	34	65.4	5.28	
Buckhannon *a* †	......	......	......	4.87	
Buckhannon *b* †	88	31	62.8	....	
Burlington †	91	33	63.6	5.85	
Charleston †	......	......	......	3.83	
Dayton †	......	......	......	4.90	
Elkhorn †	89	37	65.4	4.70	
Fairmont †	......	......	......	4.41	
Glenville †	87	37	65.2	5.89	
Grafton †	92	31	65.4	4.68	
Green Sulphur	90	37	67.2	1.90	
Harpers Ferry †	......	......	......	4.29	
Hewett †	92	39	68.8	3.59	
Hinton *a* †	......	......	......	3.91	
Hinton *b* †	92	38	67.2	....	
Marlinton †	85	29	61.4	4.48	
Martinsburg †	93	39	66.2	3.50	
Morgantown *a* †	......	......	......	4.19	
Morgantown *b*	93	35	65.9	3.78	
New Martinsville †	91	33	65.6	4.28	
Nuttallburg †	89	30	63.5	3.75	
Oldfields †	90	32	65.0	6.43	
Pennsboro	92	32	65.1	4.84	
Philippi †	95	36	69.0	7.06	
Point Pleasant †	91	38	67.0	3.79	
Powellton †	89	38	65.6	4.50	
Rowlesburg †	......	......	......	3.49	
Tannery *[1]	89	32	60.0	....	
Weston *a* †	......	......	......	4.02	
Weston *b* *[1]	88	38	65.5	....	
Wheeling *a* †	......	......	......	3.91	
Wheeling *b* †	90	40	66.5	3.87	
White Sulphur Springs †	93	28	64.2	5.15	
Wisconsin.					
Amherst	78	19	53.4	4.09	
Antigo †	81	20	51.3	2.42	
Apollonia *†[1]	78	24	57.7	2.18	
Bayfield †	81	34	57.8	1.27	
Beloit	86	35	59.4	7.59	
Boscobel †	84	29	56.8	4.49	
Centralia	83	29	55.8	4.80	
Chilton	85	31	56.4	5.05	
Citypoint	96	23	52.7	5.03	
Crandon †	80	20	53.2	1.80	T.
Delavan †	86	31	58.3	8.79	
Depere †	84	33	56.0	4.39	
Dodgeville †	84	26	54.4	4.16	
Easton †	84	26	55.4	4.75	
Eau Claire [1]	82	32[e]	56.9	3.03	
Florence †	78	25	52.0	1.89	
Grand River Lock	......	......	......	4.08	
Grantsburg †	78	23	52.0	2.63	
Gratiot †	85	30	58.1	5.96	
Hartford	......	......	......	5.58	
Harvey †	85	32	57.0	5.66	
Hayward †	79	21	52.8	2.03	
Wisconsin—Cont'd.					
Hillsboro	85	24	54.6	3.35	
Koepenick *†[1]	78	34	55.2	2.30	
Lancaster †	86	30	55.9	4.21	
Lincoln †[2]	......	......	58.1	4.98	
Madison †	81	36	57.6	4.29	
Manitowoc †	77	34	55.3	4.81	
Meadow Valley †	84	25	54.6	4.89	
Medford †	89	21	54.0	2.33	T.
Menasha	......	......	......	3.63	
Neillsville †	80	26	54.0	4.88	
New Holstein †	85	32	56.7	7.92	
New London	83	32	55.6	4.08	
Oconomowoc †	84[e]	31[e]	58.2[e]	5.85	
Oconto	82	31	55.6	4.04	
Osceola †	80	24	56.0	2.77	
Oshkosh †	85	32	57.1	4.89	
Pepin	83	27	55.6	2.53	
Pine River †	86	31	56.6	3.76	
Portage †	84	30	56.0	3.94	
Port Washington	83	32	57.0	5.50	
Prairie du Chien	85	23	54.6	4.27	
Racine	90	35	59.8	9.22	
Sharon †	88	30	56.1	9.58	
Shawano	80	28	54.0	3.42	
Spooner †	80	22	51.8	2.00	
Stevens Point †	83	28	55.6	4.94	
Sturgeon Bay Canal *[10]	80	35	54.4	....	
Valley Junction †	84	26	54.6	3.83	
Viroqua	85	31	56.3	3.77	
Watertown †	85	32	57.3	5.69	
Waukesha †	84	34	58.2	5.71	
Waupaca †	84	30	56.6	4.21	
Wausau †	80	28	54.1	2.26	
Westbend	82	28	55.8	7.83	T.
Westfield †	87	30	56.5	4.02	
Wyoming.					
Bighorn Ranch †	77	19	47.6	0.92	
Cheyenne	......	......	......	....	2.0
Fort Laramie †	96[e]	29[e]	62.6[e]	1.75	
Fort Washakie †	86	22	54.0	0.93	
Fort Yellowstone †	81	21	49.2	1.10	T.
Laramie	80	23	52.4	1.16	4.3
Lusk †	88	27	54.0	1.97	3.0
Sheridan	87	27	53.4	2.33	
Sundance	83	27	51.9	3.35	
Wheatland †	99	28	59.0	0.40	
Mexico.					
Ciudad P. Diaz	97	55	81.1	2.14	
Leon de Aldamas	84	54	69.0	4.47	
Mexico	77	50	64.2	3.34	
Puebla	80	50	66.0	4.27	
Topolobampo *[1]	96	77	84.9	3.30	
New Brunswick.					
St. John	72	36	54.0	7.76	
West Indies.					
Grand Turk Island	......	......	.....	4.90	

Late reports for August, 1896.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Coal Harbor	65	38	51.0	6.79	
Killisnoo	70	41	54.6	3.40	
Kodiak *[1]	69	45	52.9	....	
California.					
Morena Dam *[1]	97	38	70.6	1.51	
Colorado.					
Arkins	......	......	......	1.44	
Longs Peak	78	28	55.0	2.95	
Manhattan	......	......	......	1.43	
Florida.					
Avon Park	99	70	84.3	3.17	
Georgia.					
Athens	97	59	81.0	1.00	
Camak	99	58	81.8	2.89	
Union Point	94	59	79.8	2.67	
Washington	96	61	81.0	1.54	
Waynesboro	98	58	80.5	3.21	
Idaho.					
American Falls	97	39	69.3	0.74	
Kansas.					
Coldwater	106	55	82.1	0.30	
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Delphos *[1]	103	57	78.2	1.62	
Eldorado	105	42	77.2	0.52	
Halstead	107	54	78.8	0.96	
Oswego	105	54	8?.6	2.47	
Tribune [e]	102	48	76.2	2.30	
Louisiana.					
Abbeville	95	70	83.2	4.05	
Maine.					
Orono	92	39	64.3	4.26	
Massachusetts.					
North Billerica	94	45	69.6	2.58	
Minnesota.					
Alexandria	92	40	66.9	....	
Campbell	96	32	66.7	1.59	
Winnebago City	99	43	70.3	1.81	
Mississippi.					
Mosspoint	97	70	84.8	5.10	
Nevada.					
Downeyville [j]	105	52	76.8	0.02	
New York.					
Palermo	96	41	68.7	2.13	
North Carolina.					
Highlands	84	46	67.8	1.54	
North Dakota.					
Larimore [f]	93	39	61.0	3.42	
Lisbon	98	38	66.0	2.34	
Ohio.					
Fostoria	98	41	74.2	1.84	
Texas.					
Austin *a*	100	65	85.6	....	
Washington.					
West Ferndale	81	35	63.3	0.84	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

† Weather Bureau instruments.

‡ Record furnished by the Arrowhead Reservoir Company, in the San Bernardino Mountains, San Bernardino County, Cal., at elevations varying from 4,900 to 6,900 feet.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[8] Mean of 7 a. m. + 2 p. m. + 9 p. m. ÷ 3.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

California, Robertsons Mills, February, 1896, make precipitation 0.00 instead of 0.07, March, 1896, make precipitation 2.20 instead of 0.00.

June, 1896, page 210, make heading of table read June, 1896, instead of May, 1896.

NOTE.—The following changes have been made in names of stations: Kentucky, Pryorsburg changed to Pilot Oak. Oregon, Salmon changed to Government Camp.

TABLE III.—*Data from Canadian stations for the month of September, 1896.*

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Precipitation. Total.	Precipitation. Departure from normal.	Prevailing direction of wind.	Total depth of snow.
	Inches.	Inches.	Inches.	°	°	Inches	Inches.		
St. Johns, N. F	29.88	30.02	+ .03	55.8	+ 0.4	4.38	....	w.	0.0
Sydney, C. B. I	29.99	30.05	+ .02	56.8	+ 0.8	4.52	+ 1.28	sw.	0.0
Grindstone, G. St. L.	29.92	29.95	....	54.5	....	4.16	....	sw.	0.0
Halifax, N. S	29.96	30.09	+ .04	58.0	+ 1.5	12.10	+ 8.55	w.	0.0
Grand Manan, N. B.	29.98	30.03	....	54.8	....	5.59	+ 3.79	w.	0.0
Yarmouth, N. S.	29.98	30.06	— .01	55.9	+ 0.4	3.10	+ 0.51	s.	0.0
St. Andrews, N. B.	....	....	....	54.2	....	3.68	+ 1.06	nw.	0.0
Charlottet'n, P. E. I.	29.98	30.02	....	56.9	....	3.20	+ 0.34	sw.	0.0
Chatham, N. B	29.98	30.00	— .01	53.6	+ 0.6	4.12	+ 1.40	w.	0.0
Father Point, Que.	29.94	29.97	— .01	48.8	— 1.2	3.15	+ 0.35	w.	0.0
Quebec, Que	29.68	30.00	— .02	52.3	— 2.7	4.72	+ 1.05	ne.	0.0
Montreal, Que	29.80	30.00	— .03	55.4	— 2.1	3.11	— 0.12	sw.	0.0
Rockliffe, Ont.	29.50	30.01	— .02	49.2	— 3.3	4.74	+ 1.04	nw.	0.0
Kingston, Ont	29.70	30.01	— .03	57.6	— 1.9	3.85	+ 1.08	sw.	0.0
Toronto, Ont	29.64	30.02	— .04	56.0	— 2.0	5.07	+ 2.32	s.	0.0
White River, Ont	28.63	29.98	....	45.6	— 3.3	1.40	— 1.68	s.	1.2
Port Stanley, Ont	29.39	30.02	— .03	57.0	....	3.67	+ 1.02	w.	0.0

TABLE III.—*Data from Canadian stations*—Continued.

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Precipitation. Total.	Precipitation. Departure from normal.	Prevailing direction of wind.	Total depth of snow.
	Inches.	Inches.	Inches.	°	°	Inches	Inches.		
Saugeen, Ont	29.30	30.01	— .03	55.0	— 1.5	3.58	+ 0.07	sw.	0.0
Parry Sound, Ont.	29.36	30.00	— .03	52.7	— 2.8	4.65	+ 0.32	w.	0.0
Port Arthur, Ont	29.24	29.94	— .02	48.8	— 1.7	1.41	— 2.06	sw.	0.0
Winnipeg, Man	29.11	29.93	+ .01	48.4	— 0.6	1.96	— 0.04	nw.	0.0
Minnedosa, Man	28.14	29.94	+ .02	45.6	— 0.9	1.63	+ 0.21	w.	0.0
Qu'Appelle, Assin.	27.72	29.98	+ .06	46.8	— 1.7	1.21	+ 0.07	nw.	0.0
Medicine Hat, Assin	27.70	29.98	+ .10	51.7	— 2.8	1.74	+ 0.89	sw.	0.0
Swift Curr't, Assin.	27.43	30.00	+ .06	48.6	— 2.4	2.08	+ 0.95	w.	0.0
Calgary, Alberta	26.47	29.99	+ .09	47.2	— 2.3	1.46	+ 0.56	w.	1.7
Prince Albert, Sask.	28.36	29.87	....	45.4	....	0.83	....	nw.	0.0
Edmonton, Alberta.	27.70	30.03	+ .13	47.4	— 1.2	0.22	— 1.27	nw.	0.0
Battleford, Sask	28.27	29.99	....	48.6	....	0.30	....	nw.	0.0
Kamloops, B. C.*	28.82	30.04	....	56.8	....	0.91	....	w.	0.0
Hamilton, Bermuda	29.96	30.12	+ .05	77.9	....	7.22	....	s.	0.0
Banff, Alberta	25.45	30.09	....	43.2	....	1.35	....	sw.	8.8
Esquimalt, B. C.	30.00	30.03	....	51.0	....	1.52	....	nw.	0.0
Ottawa, Ont	29.68	30.04	....	53.8	....	3.42	....	nw.	0.0

* Kamloops, 85 miles east of Spences Bridge.

TABLE IV.—*Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.*

Pressure is corrected for temperature and reduced to sea level, but the gravity correction, —0.06, is still to be applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10. Two directions of wind, connected by a dash, indicate change from one to the other; also same for force.

The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

August, 1896.	Pressure at sea level. 6 a. m.	Pressure at sea level. 3 p. m.	Pressure at sea level. 9 p. m.	Temperature. 6 a. m.	Temperature. 2 p. m.	Temperature. 9 p. m.	Temperature. Maximum.	Temperature. Minimum.	Relative humidity. 6 a. m.	Relative humidity. 2 p. m.	Relative humidity. 9 p. m.	Wind. Direction.	Wind. Force.	Cloudiness.	Rain measured at 6 a. m.
	Ins.	Ins.	Ins.	°	°	°	°	°	%	%	%				Ins.
1	30.05	30.00	30.06	69	83	78	87	68	85	53	68	ne.	0-2	3	0.00
2	30.05	29.99	30.03	73	83	77	87	73	75	55	67	ne.	3	1	0.00
3	30.02	30.02	30.05	75	83	77	86	73	75	56	67	ene-nne	3	3	0.00
4	30.01	29.99	30.04	75	84	77	85	75	74	58	67	ene.	3	7	0.00
5	30.04	30.00	30.05	77	83	76	87	75	71	49	67	ene.	3	5	0.00
6	30.04	30.02	30.10	75	81	76	85	74	68	58	67	ne.	4	6	0.00
7	30.00	30.03	30.10	75	82	76	85	74	66	54	68	ne.	3	2	T.
8	30.08	29.98	30.05	72	84	75	86	71	77	49	73	ne.	3-1	2	0.00
9	30.03	29.97	30.04	71	84	74	88	70	85	56	82	ese.	1	6	0.00
10	30.00	29.97	30.04	72	84	76	88	71	80	55	74	ne.	3-0	2	0.00
11	30.02	29.99	30.03	73	84	76	88	72	84	60	72	ne.	2	3-9	0.00
12	30.01	29.98	30.04	75	84	77	86	75	72	58	71	ene.	3	4	T.
13	30.02	29.97	30.04	75	83	77	85	74	74	66	72	se-ne.	2	5	T.
14	30.05	30.00	30.06	76	84	76	86	74	66	51	66	ne.	3	5	T.
15	30.03	29.98	30.04	75	83	76	88	74	68	....	66	ne.	3	4-10	0.00
16	29.98	29.97	30.07	77	82	75	85	72	76	70	86	ene-ese	5-1	9	0.40
17	30.06	30.05	30.10	76	83	76	84	73	74	62	75	ene.	3	5	1.05
18	30.05	30.00	30.08	75	82	76	85	74	72	62	66	ene.	4	5	0.00
19	30.06	30.00	30.06	74	82	76	83	73	73	49	68	ene-ne.	3	3	0.01
20	30.04	30.02	30.08	74	83	76	84	73	73	....	63	ne.	3	2	0.02
21	30.08	30.03	30.11	74	83	76	84	72	76	55	72	ne.	3	8-3	0.00
22	30.11	30.06	30.12	76	81	76	83	74	76	63	68	ne.	3	4-9	0.02
23	30.08	30.03	30.08	75	81	74	83	74	66	58	74	ne.	2	6	T.
24	30.05	30.00	30.07	73	83	74	84	71	77	55	73	nne.	2	4	T.
25	30.05	29.99	30.05	72	84	74	85	70	78	50	66	ne.	2	2	T.
26	30.04	30.00	30.04	73	82	76	84	71	71	56	72	ne.	3-0	3	0.02
27	30.02	29.98	30.03	73	84	76	86	72	80	56	72	nne.	0-3	3	0.04
28	30.02	29.98	30.04	74	85	77	87	74	75	50	69	nne.	1-3	1-8	T.
29	30.02	29.97	29.98	77	80	75	83	75	71	77	86	ne.	1	9	0.02
30	30.05	29.94	30.02	77	82	75	85	74	81	72	93	ene.	1	10	0.05
31	29.99	30.00	30.10	74	81	76	84	72	91	61	70	ene.	3	4	2.05
	30.04	30.00	30.06	74.3	82.8	75.9	85.4	72.8	75.2	57.7	71.6		2.5	4.6	3.68

Mean temperature: 6+2+9+3 is 77.7; the normal is 77.8; extreme temperatures, 88° and 68°.

The rainstorms of the 16th and 30th extended all over the Islands; the rainfall in each reaching 5.00 to 8.00 inches on Hawaii, but less than an inch in Kauai. The rain came in each case coincidently with a sharp rise of the barometer after a moderate depression attended with irregular oscillations.

Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.

September, 1896.	Pressure at sea level. 9 a. m.	Pressure at sea level. 3 p. m.	Pressure at sea level. 9 p. m.	Temperature. 6 a. m.	Temperature. 2 p. m.	Temperature. 9 p. m.	Temperature. Maximum.	Temperature. Minimum.	Relative humidity. 6 a. m.	Relative humidity. 2 p. m.	Relative humidity. 9 p. m.	Wind. Direction.	Wind. Force.	Cloudiness.	Rain measured at 6 a. m.
	Ins.	Ins.	Ins.	°	°	°	°	°	%	%	%				Ins.
1	30.10	30.05	30.11	75	82	75	84	74	68	60	77	ne.	3	5	0.01
2	30.12	30.04	30.09	74	83	75	84	73	77	59	76	nne.	3	4	0.09
3	30.06	29.98	30.02	73	84	76	85	73	82	59	71	nne.	3	2	T.
4	30.00	29.94	30.00	73	83	76	84	72	77	57	68	nne.	3	2	0.01
5	30.01	29.94	30.03	74	81	76	84	73	72	61	72	ne.	3	3	T.
6	30.06	30.00	30.06	75	82	76	83	74	70	56	66	ene.	2-4	3-9	0.00
7	30.06	30.01	30.07	75	81	75	84	74	71	56	70	ne to n.	2	8-2	0.05
8	30.07	29.99	30.02	75	80	74	84	72	71	68	68	nne.	0-3	3	0.00
9	30.01	29.94	29.99	71	82	75	86	71	81	58	70	nne.	0-2	2	0.01
10	30.00	29.92	29.99	72	84	75	89	68	85	52	71	nne.	0-2	2	0.00
11	30.00	29.92	30.03	68	82	73	85	69	85	48	71	ene.	0-2	1	0.00
12	30.03	29.96	30.05	70	82	74	86	69	83	55	71	ne.	0-1	1	0.00
13	30.07	30.00	30.05	69	82	76	83	69	83	51	70	ne.	0-4	4	0.00
14	30.07	30.00	30.06	71	81	77	86	70	79	54	59	ne.	3	2	0.01
15	30.05	29.98	30.06	70	82	76	85	70	72	53	64	ne.	4	2	0.00
16	30.03	29.98	30.02	72	83	76	85	71	75	57	66	nne.	0-3	1	0.00
17	30.05	29.95	30.06	74	82	77	86	72	82	62	69	*	0-4	1-7	0.00
18	30.03	29.95	30.01	76	82	75	86	74	70	62	78	ne-e.	3	3	0.00
19	30.02	29.95	30.02	76	84	75	87	74	74	52	70	ne.	3	2	0.11
20	30.06	30.00	30.05	76	83	76	84	75	70	51	67	ene.	3	4	0.00
21	30.10	30.01	30.04	75	83	76	84	72	71	55	69	nne-e.	3	4	T.
22	30.05	29.96	30.02	74	83	77	85	72	73	51	70	ene.	3-4	4	0.06
23	30.05	29.97	30.03	75	83	77	87	73	71	56	70	ene.	3-4	4	0.00
24	30.07	30.01	30.07	74	84	76	87	74	73	52	67	ne.	2-4	2	0.00
25	30.07	29.99	30.06	75	83	78	85	75	66	50	63	nne.	4	6	0.00
26	30.05	29.99	30.05	75	83	76	84	74	70	51	66	nne.	4	4	0.02
27	30.06	30.00	30.06	75	81	76	84	75	64	52	66	nne.	4	6	T.
28	30.08	30.01	30.06	70	82	76	84	70	75	57	64	nne.	4	6	0.09
29	30.06	29.97	30.02	71	81	75	86	73	70	50	72	nne.	3	3	0.07
30	30.01	29.94	30.01	70	81	75	86	69	90	61	68	nne.	3-2	5-1	0.08
	30.05	29.98	30.04	73.1	82.4	75.7	85.1	72.1	73.3	55.5	69.0		2.6	3.4	0.60

* se-ne., nw-w.

Mean temperature: 6+2+9+3 is 77.1; the normal is 77.2; extreme temperatures, 87° and 68°.

TABLE V.—*Mean temperature for each hour of seventy-fifth meridian time, September, 1896.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak	48.6	47.5	46.6	45.8	45.1	44.4	43.7	43.5	45.1	49.3	53.9	58.0	60.3	62.4	64.2	65.5	66.1	65.3	63.9	60.4	56.5	54.2	51.7	50.2	53.8
Boston, Mass	58.3	57.7	57.5	57.1	57.0	56.9	57.8	59.9	61.9	63.1	64.6	66.0	66.9	67.7	67.7	66.8	65.8	64.2	62.6	61.6	60.8	60.1	59.4	58.8	61.7
Buffalo, N. Y	57.5	57.0	56.6	56.8	56.5	56.8	57.6	59.0	61.1	61.8	62.9	63.3	63.9	64.2	64.5	64.3	64.0	62.9	61.9	62.1	60.8	60.2	59.2	58.0	60.5
Chicago, Ill	58.9	58.5	57.7	57.5	56.9	56.5	56.4	57.1	57.9	59.4	60.7	62.1	63.5	64.2	65.0	65.6	65.1	64.6	63.6	62.8	62.0	61.2	59.9	59.2	60.7
Cincinnati, Ohio	62.5	61.7	60.8	60.3	59.3	58.5	58.7	60.2	63.3	65.7	68.1	69.8	71.1	72.1	73.2	73.3	73.0	72.2	70.5	69.1	67.2	65.6	64.5	63.4	66.0
Cleveland, Ohio	59.3	59.2	58.6	58.3	57.6	57.1	57.3	58.6	60.6	62.5	64.0	64.7	65.3	65.2	65.5	65.9	66.3	66.4	65.2	63.2	62.1	61.2	60.4	59.7	61.8
Detroit, Mich	56.9	55.9	55.3	54.7	54.3	54.1	54.1	55.5	57.4	59.5	61.6	63.6	64.9	65.5	66.0	66.2	65.4	64.4	62.5	60.9	60.0	58.9	58.0	57.4	59.7
Dodge City, Kans	60.5	59.7	58.8	58.4	57.6	56.4	55.7	55.2	57.8	62.0	66.1	69.6	72.6	74.5	76.3	77.4	77.3	76.3	74.3	70.5	66.8	64.0	62.5	61.1	65.5
Eastport, Me	51.8	51.7	51.3	51.0	50.7	50.8	51.8	53.4	54.4	55.7	57.0	58.0	58.2	58.4	58.2	57.7	56.6	55.3	54.8	54.4	53.7	53.1	52.7	52.5	54.3
Galveston, Tex	80.0	79.7	79.5	79.1	78.9	78.2	78.0	78.2	78.4	78.9	80.1	80.9	81.7	81.7	81.8	81.9	81.9	81.9	81.6	81.0	80.7	80.4	80.2	80.0	80.2
Havre, Mont	49.3	48.4	47.6	46.4	45.2	44.1	43.2	42.7	42.3	45.1	49.2	53.3	57.0	59.5	61.2	62.1	62.5	62.2	61.4	60.0	57.0	54.1	52.5	50.7	52.4
Kansas City, Mo	61.2	60.6	59.7	59.3	58.7	58.1	57.5	57.5	59.3	62.1	64.8	66.7	69.0	70.5	71.4	71.9	71.9	70.6	68.7	67.0	65.4	64.0	62.9	61.9	64.2
Key West, Fla	81.1	81.2	81.2	81.0	81.0	80.7	80.9	81.9	82.9	83.5	83.9	84.3	84.4	84.5	84.6	84.6	84.2	83.5	82.5	82.2	82.0	81.8	81.4	81.3	82.5
Memphis, Tenn	69.6	68.6	67.6	66.9	66.2	65.5	65.5	66.3	68.3	70.5	73.6	76.5	78.0	79.6	80.4	81.0	81.0	80.1	78.5	77.0	74.5	73.1	71.9	70.5	73.0
New Orleans, La	75.0	74.7	74.4	74.0	73.6	73.5	73.3	74.0	76.3	78.5	80.4	82.0	83.3	83.5	83.4	83.3	83.2	82.5	80.7	78.5	77.5	76.2	75.7	75.3	78.0
New York, N. Y	62.0	61.5	60.9	60.5	59.9	59.8	59.9	60.7	62.2	64.2	65.8	67.4	68.6	69.3	69.5	69.2	68.3	66.9	65.8	65.4	64.7	64.2	63.5	62.6	64.3
Philadelphia, Pa	64.3	63.7	63.4	62.8	62.2	61.9	62.4	63.4	65.4	67.6	69.4	71.2	72.4	73.7	73.8	73.8	73.2	71.2	69.3	68.1	67.1	66.1	65.6	64.9	67.4
Pittsburg, Pa	61.4	60.4	59.4	58.6	58.0	57.7	58.2	60.4	62.5	65.3	68.0	69.6	71.2	71.8	72.8	73.0	72.5	71.5	69.9	67.6	66.1	64.7	63.5	62.2	65.3
Portland, Oreg	60.5	59.1	57.7	56.6	55.6	54.7	53.7	52.9	51.9	51.7	53.0	55.2	58.3	61.0	64.5	66.2	68.4	69.3	69.4	68.7	66.8	64.8	63.0	61.6	60.2
St. Louis, Mo	64.4	63.7	62.7	61.8	61.6	60.7	60.4	61.5	62.8	65.0	67.6	70.2	71.9	73.8	75.4	76.1	75.9	74.0	71.9	69.9	68.7	67.9	66.7	65.2	67.5
St. Paul, Minn	53.4	52.6	51.6	51.0	50.3	49.5	48.6	48.5	50.8	53.3	56.3	58.2	60.7	62.4	63.4	64.0	64.4	64.1	62.9	61.1	58.9	57.2	55.9	54.6	56.4
Salt Lake City, Utah	61.5	60.7	60.1	59.2	58.9	58.1	57.3	56.9	56.1	58.8	63.6	67.3	70.1	71.8	72.2	72.8	73.1	73.5	72.7	71.0	68.0	65.7	63.6	62.0	64.8
San Diego, Cal	64.5	64.1	63.7	63.6	63.2	63.0	63.0	62.6	61.5	62.3	64.8	67.1	69.2	70.6	71.2	71.4	71.7	71.4	70.3	69.1	68.0	67.0	66.0	65.3	66.4
San Francisco, Cal	56.6	56.1	56.0	55.9	55.6	55.4	55.2	55.6	55.4	55.5	56.6	57.8	59.8	61.4	62.8	63.5	63.5	63.0	61.6	60.1	58.9	58.0	57.2	56.9	58.3
Savannah, Ga	72.8	71.7	71.1	70.4	69.7	69.1	69.9	73.0	76.9	80.5	82.6	83.6	84.1	84.8	84.1	83.3	81.7	79.9	77.5	76.4	75.6	74.9	74.1	73.4	76.7
Washington, D. C	61.8	61.2	60.6	60.1	59.8	59.7	60.8	64.1	66.7	69.0	71.5	73.2	74.3	75.5	76.1	75.4	74.3	72.4	69.6	67.7	66.2	64.8	63.8	62.6	67.1

TABLE VI.—*Mean pressure for each hour of seventy-fifth meridian time, September, 1896.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak	28.242	.242	.241	.244	.244	.247	.252	.257	.262	.263	.260	.255	.245	.234	.220	.211	.204	.205	.209	.212	.223	.233	.241	.245	.237
Boston, Mass	29.904	.900	.895	.895	.898	.906	.918	.920	.923	.919	.910	.902	.889	.877	.872	.871	.874	.880	.887	.898	.903	.903	.903	.901	.898
Buffalo, N. Y	29.204	.201	.198	.197	.205	.212	.221	.220	.221	.220	.217	.211	.205	.197	.190	.185	.182	.184	.187	.193	.200	.199	.197	.194	.202
Chicago, Ill	29.148	.145	.140	.141	.141	.149	.163	.170	.175	.181	.184	.178	.170	.157	.146	.141	.141	.140	.137	.141	.146	.149	.147	.148	.153
Cincinnati, Ohio	29.378	.377	.372	.374	.379	.385	.397	.401	.406	.410	.407	.400	.389	.377	.363	.352	.354	.356	.360	.365	.377	.381	.381	.378	.380
Cleveland, Ohio	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Detroit, Mich	29.241	.240	.239	.239	.241	.245	.254	.260	.265	.272	.270	.263	.254	.242	.230	.224	.222	.223	.224	.229	.234	.237	.236	.234	.242
Dodge City, Kans	27.446	.442	.445	.445	.447	.452	.457	.457	.469	.472	.476	.469	.453	.435	.414	.398	.387	.380	.381	.389	.408	.428	.440	.445	.435
Eastport, Me	29.942	.938	.939	.940	.949	.958	.965	.971	.973	.972	.963	.956	.948	.941	.932	.929	.929	.933	.938	.943	.945	.943	.942	.942	.947
Galveston, Tex	29.968	.965	.959	.957	.957	.962	.973	.981	.988	.993	.996	.999	.989	.975	.959	.945	.940	.938	.938	.939	.956	.969	.972	.973	.966
Havre, Mont	27.404	.403	.406	.403	.405	.402	.404	.408	.415	.419	.421	.420	.416	.408	.397	.390	.382	.378	.379	.381	.385	.395	.402	.405	.401
Kansas City, Mo	29.029	.031	.028	.029	.032	.041	.054	.064	.063	.072	.069	.063	.047	.032	.019	.007	.998	.999	.998	.002	.014	.027	.030	.032	.033
Key West, Fla	29.955	.946	.934	.930	.932	.939	.954	.966	.977	.983	.983	.974	.959	.942	.924	.918	.918	.923	.934	.953	.960	.967	.968	.962	.950
Memphis, Tenn	29.619	.618	.615	.617	.617	.623	.635	.647	.655	.662	.667	.663	.651	.638	.619	.601	.592	.588	.587	.591	.604	.613	.620	.622	.623
New Orleans, La	29.953	.948	.946	.946	.950	.960	.970	.977	.986	.995	.996	.988	.973	.956	.940	.932	.928	.930	.935	.940	.956	.966	.967	.964	.958
New York, N. Y	29.708	.702	.701	.704	.710	.718	.726	.730	.735	.734	.727	.719	.707	.693	.683	.678	.679	.683	.690	.697	.704	.706	.707	.704	.706
Philadelphia, Pa	29.930	.926	.926	.928	.935	.941	.953	.958	.962	.961	.954	.945	.929	.914	.902	.892	.893	.897	.902	.913	.921	.923	.926	.924	.927
Pittsburg, Pa	29.160	.158	.160	.159	.163	.168	.176	.183	.182	.179	.172	.165	.157	.146	.137	.129	.126	.127	.135	.144	.152	.152	.151	.152	.156
Portland, Oreg	29.847	.851	.856	.859	.861	.862	.864	.868	.874	.881	.888	.891	.888	.885	.866	.855	.838	.829	.824	.822	.824	.832	.841	.848	.856
St. Louis, Mo	29.438	.439	.438	.438	.443	.449	.461	.466	.470	.475	.474	.465	.454	.439	.421	.412	.410	.408	.410	.417	.430	.433	.436	.437	.440
St. Paul, Minn	29.106	.106	.107	.108	.112	.115	.122	.129	.132	.135	.138	.134	.121	.108	.095	.085	.078	.076	.078	.083	.091	.097	.100	.103	.107
Salt Lake City, Utah	25.622	.627	.629	.629	.633	.634	.640	.643	.655	.658	.663	.664	.657	.646	.634	.628	.615	.609	.602	.600	.602	.610	.620	.626	.631
San Diego, Cal	29.843	.844	.844	.843	.839	.835	.832	.836	.846	.853	.861	.868	.871	.865	.854	.844	.834	.825	.818	.817	.819	.822	.833	.841	.841
San Francisco, Cal	29.787	.790	.790	.791	.788	.784	.782	.785	.793	.804	.813	.821	.825	.821	.813	.801	.786	.776	.770	.765	.764	.768	.779	.786	.791
Savannah, Ga	29.931	.927	.924	.925	.930	.944	.960	.970	.976	.974	.964	.946	.916	.906	.891	.886	.887	.893	.901	.917	.927	.933	.937	.936	.929
Washington, D. C	29.938	.939	.938	.939	.945	.952	.962	.966	.976	.973	.965	.953	.935	.915	.902	.895	.891	.897	.900	.912	.919	.918	.917	.927	.932

TABLE VII.—*Average wind movement for each hour of seventy-fifth meridian time, September, 1896.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex	7.5	7.1	7.7	7.7	7.3	7.3	7.6	7.5	7.8	10.1	11.1	11.3	10.8	10.8	10.8	11.0	10.6	10.0	10.3	9.9	7.7	7.0	6.8	7.1	8.9
Albany, N. Y	6.4	6.0	6.1	6.5	7.0	6.6	6.3	7.7	8.8	9.8	10.7	11.0	10.8	11.1	11.0	10.5	8.9	8.2	7.6	8.3	7.3	7.0	6.2	6.4	8.2
Alpena, Mich	7.4	7.4	7.6	7.6	6.9	7.1	7.5	7.9	8.9	10.3	10.6	11.6	11.4	11.7	12.7	12.8	12.5	11.5	10.2	9.3	8.4	8.7	8.7	8.2	9.5
Amarillo, Tex	14.4	14.6	14.7	14.8	15.3	15.5	14.8	14.1	14.8	16.6	16.6	16.0	16.0	15.9	16.2	15.8	15.5	15.4	14.5	14.0	13.6	13.2	13.2	14.4	15.0
Atlanta, Ga	8.7	9.0	8.7	8.2	7.4	7.7	7.3	7.2	7.4	8.0	8.1	8.1	8.9	9.1	9.2	9.1	9.7	8.5	7.5	7.1	8.1	8.7	8.9	8.8	8.3
Augusta, Ga	3.8	3.5	3.1	2.8	2.9	2.7	2.8	3.7	5.0	5.8	6.5	6.5	6.7	7.4	7.8	7.9	7.6	6.7	5.9	5.7	4.9	4.1	3.6	3.8	5.0
Baker City, Oreg	4.4	4.0	4.7	5.5	5.6	6.2	6.6	7.0	7.2	7.0	5.7	3.4	3.8	4.6	4.8	5.4	6.0	6.3	6.6	6.1	4.4	4.3	4.3	4.4	5.4
Baltimore, Md	3.9	3.5	3.5	3.1	3.2	3.3	3.8	4.7	5.6	6.2	6.0	6.3	6.4	6.5	6.8	6.4	5.1	5.3	4.2	3.6	3.6	3.8	4.5	4.9	4.8
Bismarck, N. Dak	7.4	6.2	6.5	6.0	6.3	6.2	5.9	5.6	6.1	7.3	9.3	10.8	12.2	13.0	13.4	13.8	15.2	14.5	13.0	10.1	7.7	7.6	7.8	7.2	9.1
Block Island, R. I	15.9	16.5	17.0	17.0	17.1	16.9	17.4	18.1	18.9	18.9	19.4	18.7	19.1	18.7	18.2	18.4	19.1	17.7	17.3	16.0	15.7	15.3	15.6	15.9	17.5
Boston, Mass	10.2	10.2	10.2	10.2	9.9	10.4	10.5	11.2	11.9	13.5	13.5	13.3	13.0	12.9	13.1	13.3	12.5	11.1	10.7	9.8	9.1	9.3	9.3	9.5	11.2
Buffalo, N. Y	12.1	11.2	11.4	12.2	12.7	11.7	11.9	11.7	11.9	13.0	13.5	13.7	14.7	15.2	16.2	16.5	15.2	14.4	13.0	13.5	14.2	13.4	12.8	12.5	13.3
Cairo, Ill	6.3	6.4	6.2	6.4	6.1	5.7	5.7	6.1	6.8	7.8	8.0	8.3	9.1	9.4	10.2	10.2	10.0	8.6	7.6	6.4	5.7	5.9	6.8	6.6	7.3
Cape Henry, Va	12.8	12.7	12.2	12.5	13.0	13.5	13.8	14.1	14.3	14.4	13.6	14.2	14.3	13.8	13.2	12.3	11.5	10.8	10.9	11.8	11.4	11.9	13.0	12.5	12.8
Charleston, S. C	5.9	5.3	5.3	5.6	5.5	5.8	6.4	7.1	8.3	8.5	9.1	10.5	11.9	13.0	12.6	12.1	11.3	10.2	9.0	7.6	7.2	6.0	6.1	5.6	8.2
Charlotte, N. C	4.7	5.4	4.9	4.8	4.5	4.3	4.6	4.8	5.4	6.3	6.9	6.8	6.5	6.3	6.7	6.5	6.2	6.3	5.4	5.4	5.3	5.0	4.9	5.2	5.5
Chattanooga, Tenn	3.8	3.4	3.3	3.3	2.8	3.2	3.2	3.9	5.3	6.2	6.8	7.6	8.4	8.8	9.0	9.0	8.5	7.8	6.6	5.7	5.4	4.7	4.0	3.3	5.6
Cheyenne, Wyo	7.4	7.1	7.0	6.5	6.6	7.1	7.1	7.1	8.2	8.9	9.4	11.0	12.6	11.4	11.5	11.9	12.6	12.2	12.3	10.7	8.5	8.3	7.8	7.7	9.2
Chicago, Ill	15.9	16.6	16.2	14.8	14.8	14.8	15.3	15.6	16.6	16.9	17.2	17.3	18.1	17.6	17.6	18.2	18.0	17.1	16.1	15.8	16.0	16.1	17.0	16.2	16.5
Cincinnati, Ohio	4.7	4.7	4.8	5.3	5.2	5.1	4.8	5.3	6.0	7.2	7.9	8.0	7.8	7.9	8.4	9.5	9.3	8.5	7.3	6.5	5.3	5.1	5.0	5.1	6.4
Cleveland, Ohio	12.3	12.1	11.5	11.3	10.6	10.6	10.8	10.9	11.5	11.9	12.6	13.3	13.5	14.4	14.7	13.6	12.9	11.9	10.5	10.6	10.8	10.7	10.8	11.5	11.9
Columbia, Mo	6.7	7.0	6.3	6.3	6.4	7.3	6.9	6.7	7.7	8.2	9.2	9.7	9.5	9.3	9.6	10.1	9.9	9.2	7.3	6.6	6.8	7.3	7.0	6.5	7.8
Columbus, Ohio	4.9	4.7	4.6	4.4	4.6	4.9	4.9	4.6	5.4	6.3	6.4	6.5	6.5	7.1	7.3	7.5	7.1	6.2	5.3	5.4	5.8	5.2	5.4	5.0	5.7
Concordia, Kans	4.9	4.7	4.9	5.8	5.6	5.2	4.8	4.8	5.7	6.6	7.9	8.5	8.2	8.0	7.7	7.6	7.6	7.6	6.8	5.0	4.4	5.3	4.9	5.3	6.2
Corpus Christi, Tex	12.4	10.8	10.2	9.5	8.2	7.6	7.5	8.0	8.4	8.4	9.3	10.4	12.1	13.2	14.0	14.9	15.6	15.8	15.7	15.0	14.6	13.9	13.2	12.2	11.7
Davenport, Iowa	7.4	7.1	6.8	6.8	6.8	6.7	7.0	7.0	8.3	8.8	10.2	10.9	11.6	11.6	11.0	11.3	11.3	10.9	9.0	8.1	7.7	6.7	7.0	7.1	8.6
Denver, Colo	5.5	6.7	6.7	5.6	5.3	5.7	5.4	6.1	5.8	6.2	7.2	7.3	8.5	8.4	8.2	8.7	8.6	9.1	9.0	7.6	8.0	7.5	6.1	6.1	7.1
Des Moines, Iowa	4.9	5.3	5.1	4.9	4.8	4.6	4.6	4.8	6.2	7.9	9.3	8.9	9.9	9.8	9.6	10.0	9.5	8.3	6.5	5.7	5.0	5.1	5.2	5.1	6.7
Detroit, Mich	7.6	8.1	7.9	8.1	7.8	8.1	8.1	8.1	9.1	9.7	10.1	10.3	10.4	10.7	11.3	11.1	10.8	9.4	7.6	7.5	8.0	8.4	8.1	8.1	8.9
Dodge City, Kans	8.8	9.2	8.7	8.3	8.0	7.9	7.8	8.5	9.1	11.6	12.9	12.6	12.1	11.4	11.5	11.5	12.6	12.8	12.4	10.8	9.6	10.5	10.3	9.8	10.4
Dubuque, Iowa	3.2	3.0	3.2	3.4	3.3	3.0	3.0	3.2	3.9	4.8	5.3	6.0	6.1	6.3	6.7	6.3	6.2	5.2	4.2	3.5	3.8	3.6	3.6	3.4	4.3
Duluth, Minn	10.4	10.9	11.1	10.4	10.3	9.4	9.4	8.5	9.4	10.9	10.8	11.3	11.3	11.3	11.6	11.8	12.1	11.1	9.2	9.0	9.6	8.6	10.1	11.4	10.4
Eastport, Me	7.7	8.2	8.3	8.1	8.3	8.7	8.7	9.4	10.0	10.1	10.6	11.3	11.5	11.7	11.5	11.3	10.5	9.8	9.4	8.9	8.2	8.4	8.6	8.7	9.5
El Paso, Tex	9.1	10.3	10.8	9.9	10.0	9.4	8.5	8.6	7.8	9.0	9.9	10.5	10.7	10.6	10.6	10.7	11.3	11.1	11.2	10.6	10.3	10.3	9.4	8.1	9.9
Erie, Pa	9.9	10.6	10.2	10.0	10.1	9.8	10.0	10.2	10.9	11.5	12.1	11.8	12.2	12.1	11.2	11.3	10.7	9.9	9.4	10.1	9.7	10.1	9.1	9.7	10.5
Eureka, Cal	4.6	3.8	3.6	3.1	3.3	3.3	2.9	2.4	2.7	2.6	2.6	2.9	3.9	5.4	6.0	6.7	7.1	7.5	7.3	6.8	5.3	4.4	3.8	4.6	4.4
Fort Canby, Wash	8.2	7.6	7.8	8.3	8.1	8.4	7.8	7.2	7.4	8.0	8.7	7.7	7.4	8.0	9.2	10.0	10.2	9.6	9.5	8.4	8.3	9.2	9.1	8.6	8.5
Fort Smith, Ark	5.4	5.4	4.9	5.5	5.1	5.6	6.1	5.9	6.8	7.6	7.0	6.9	7.7	7.2	7.5	7.9	8.4	8.2	7.0	6.0	5.6	5.4	5.3	5.0	6.4
Fresno, Cal	6.7	7.1	6.9	6.5	6.3	5.5	4.9	4.4	3.9	3.5	3.6	4.1	4.2	4.6	5.0	5.2	5.2	4.8	5.2	5.6	5.3	4.9	5.8	6.3	5.2
Galveston, Tex	10.1	10.2	9.4	9.0	8.8	8.9	8.9	9.2	10.0	10.3	10.9	10.5	11.1	10.9	11.2	11.3	11.9	10.8	10.5	10.5	10.8	10.2	10.3	9.8	10.2
Grand Haven, Mich	8.5	8.4	8.5	8.2	8.4	7.6	7.8	8.0	8.6	9.9	10.7	10.9	11.2	11.6	11.7	11.4	10.8	9.5	8.9	8.3	7.8	7.5	7.2	8.1	9.1
Greenbay, Wis	8.1	8.1	7.8	8.0	8.0	7.7	7.4	7.6	8.2	9.6	9.8	9.8	10.5	10.6	10.7	10.7	10.3	9.3	8.8	7.8	8.3	8.2	8.3	8.5	8.8
Hannibal, Mo	6.5	6.3	6.1	6.5	7.5	7.7	8.2	8.1	8.8	9.5	10.3	10.6	11.6	11.3	10.6	10.7	10.3	9.2	7.9	7.5	7.8	7.6	7.1	6.7	8.5
Harrisburg, Pa	6.3	6.3	5.2	5.2	5.1	4.9	4.8	5.3	5.7	6.2	7.0	7.8	8.2	8.8	9.4	9.3	9.5	8.6	6.8	7.0	6.9	6.4	6.1	6.2	6.8
Hatteras, N. C	10.5	10.5	10.4	10.4	10.7	10.8	11.6	11.4	11.9	12.6	12.7	12.6	12.7	13.0	12.9	12.7	12.1	11.4	11.3	11.8	11.6	11.2	10.4	10.5	11.6
Havre, Mont	5.4	5.7	6.4	6.2	6.0	6.0	6.5	6.2	6.2	6.5	8.7	9.4	10.3	10.2	11.1	11.4	11.0	10.3	9.3	8.1	6.2	5.5	5.5	5.1	7.6
Helena, Mont	7.3	7.1	6.7	6.9	6.2	6.3	5.4	4.3	4.3	4.1	4.1	4.2	5.8	5.8	5.9	7.4	7.8	7.7	7.2	6.9	6.9	7.4	8.3	7.8	6.3
Huron, S. Dak	12.1	11.9	11.2	11.3	11.3	12.0	11.6	11.9	12.7	15.4	16.6	16.4	16.3	16.5	16.6	16.4	15.7	15.5	13.8	12.1	11.5	11.7	12.4	12.1	13.5
Idaho Falls, Idaho	6.9	7.2	7.3	7.6	7.6	6.7	6.2	6.0	6.1	6.2	7.2	7.7	8.3	9.2	8.8	9.1	9.8	9.3	10.4	10.2	9.1	8.9	7.9	7.3	8.0
Indianapolis, Ind	7.6	7.2	6.6	6.6	6.6	7.0	7.2	7.4	8.3	9.1	10.3	10.7	10.8	11.0	11.1	11.6	11.4	11.3	9.0	8.5	8.2	8.7	8.5	8.0	8.9
Jacksonville, Fla	4.7	4.7	4.6	4.3	4.9	4.5	5.1	5.1	6.5	8.8	10.4	10.2	10.0	10.0	9.8	10.8	10.1	9.0	6.9	5.3	4.8	5.3	4.9	4.7	6.9
Jupiter, Fla	7.6	7.7	7.7	7.5	7.2	8.1	8.2	7.9	8.9	10.0	11.0	11.7	10.8	11.2	12.3	12.0	11.0	10.6	10.4	10.1	9.7	9.8	9.2	8.4	9.6
Kansas City, Mo	6.8	6.8	6.9	7.1	7.0	6.9	6.9	6.8	7.3	7.9	9.0	9.5	10.2	10.2	10.6	10.2	9.5	8.9	7.7	7.2	6.8	6.5	6.8	6.9	7.9
Keokuk, Iowa	5.2	5.3	5.4	5.7	6.2	5.9	5.9	6.6	7.1	8.2	8.3	9.4	9.5	9.1	9.3	8.9	8.5	8.1	7.2	6.9	6.1	6.2	5.6	5.4	7.1
Key West, Fla	9.0	8.6	8.6	8.6	8.6	8.9	8.8	9.3	10.2	10.2	10.6	10.5	11.0	10.8	10.3	10.3	9.6	9.8	9.8	9.8	10.2	9.6	10.1	9.6	9.7
Kittyhawk, N. C	12.7	12.7	12.8	13.0	12.7	13.6	14.9	15.2	15.7	16.1	15.4	14.6	14.9	15.2	15.6	16.2	16.0	15.9	15.3	15.1	15.0	14.0	12.3	12.2	14.5
Knoxville, Tenn	3.2	2.8	3.0	2.9	2.7	2.6	2.5	3.8	5.6	6.2	6.5	6.5	7.0	7.2	7.5	7.1	7.0	6.1	5.7	4.4	4.0	3.2	3.4	3.2	4.8
La Crosse, Wis	5.1	5.5	5.4	5.7	5.7	5.1	4.9	5.3	5.8	6.7	7.3	7.6	8.4	8.2	8.4	8.5	8.2	7.3	6.2	5.2	5.1	5.5	5.2	5.3	6.3
Lander, Wyo	3.0	2.8	2.3	2.9	2.9	2.9	2.7	2.4	1.5	1.7	2.6	2.8	3.1	4.3	5.0	6.2	5.9	5.6	5.4	4.0	3.8	4.5	3.8	3.3	3.6
Lexington, Ky	9.7	9.2	9.2	9.4	9.5	9.5	9.6	8.7	9.5	10.7	11.4	10.9	11.7	11.3	10.6	11.7	10.9	10.4	9.2	8.9	9.3	9.5	9.5	9.8	10.0
Little Rock, Ark	5.2	4.6	4.4	4.2	3.9	4.0	3.8	3.9	5.4	6.1	6.6	6.8	8.0	8.3	8.8	8.8	8.2	8.5	6.6	5.0	4.8	4.7	4.8	5.1	5.9
Los Angeles, Cal	2.0	1.9	1.8	1.7	1.8	1.9	1.9	2.0	2.0	2.0	2.5	3.0	3.5	4.6	6.3	7.4	8.4	9.3	8.7	8.0	6.4	4.2	3.2	2.8	4.0
Louisville, Ky	5.7	5.8	6.0	6.2	5.6	5.0	5.0	5.5	6.2	7.0	8.3	8.7	8.8	8.8	9.4	9.2	9.2	8.8	7.7	6.5	5.9	5.7	5.7	5.7	6.9
Lynchburg, Va	1.9	1.8	2.0	1.7	2.2	1.9	2.1	2.6	3.3	4.4	4.9	5.0	4.8	5.4	4.9	5.0	5.0	4.3	3.4	2.6	2.8	2.4	2.4	2.2	3.3
Marquette, Mich	10.6	11.4	11.2	11.3	11.7	11.1	11.1	12.6	12.9	12.0	12.2	12.8	13.6	13.9	13.9	13.6	12.6	11.5	9.4	9.5	10.5	11.0	11.1	11.0	11.8
Memphis, Tenn	8.7	8.6	8.1	8.5	8.2	8.1	7.8	8.2	7.9	8.6	8.4	8.2	9.1	9.6	9.5	9.2	9.6	8.5	7.8	6.8	7.2	8.2	8.4	8.7	8.4
Miles City, Mont	4.8	4.3	4.3	4.2	4.3	4.3	4.5	4.1	4.4	5.8	6.5	7.7	9.1	9.2	9.0	10.3	10.4	9.8	9.2	6.6	5.3	4.6	4.0	4.5	6.3
Milwaukee, Wis	8.5	8.6	8.7	8.3	8.2	8.6	8.4	8.7	9.7	10.3	11.6	11.1	11.7	11.9	11.9	11.7	10.7	9.9	9.3	8.7	8.9	9.8	9.0	8.9	9.7
Mobile, Ala	4.5	4.2	4.3	4.5	4.8	4.8	4.7	5.0	6.2	6.4	6.8	7.1	6.8	7.2	7.5	8.5	10.1	9.9	8.8	6.6	6.0	5.7	4.8	5.0	6.3
Montgomery, Ala	5.2	4.6	4.1	4.2	4.1	3.7	3.5	4.0	5.6	6.1	6.8	6.0	6.9	7.0	7.4	7.3	7.0	6.6	4.9	5.0	4.9	5.3	5.7	5.1	5.5
Moorhead, Minn	9.5	9.7	9.5	9.5	9.8	9.3	9.4	9.7	9.6	10.5	11.6	11.8	12.8	12.6	12.8	13.1	13.0	12.0	10.2	8.8	9.3	9.3	9.8	9.7	10.6
Nantucket, Mass	10.0	10.3	10.5	11.4	12.4	12.9	12.6	13.6	14.2	14.5	14.4	14.6	14.5	14.9	14.7	14.5	13.4	12.0	10.9	11.1	10.7	10.8	10.9	10.1	12.5
Nashville, Tenn	4.6	4.8	4.9	4.6	4.3	4.1	4.0	4.6	5.8	6.4	7.2	7.5	7.8	8.5	8.8	8.9	8.4	9.0	6.9	5.8	5.4	4.7	4.5	4.4	6.1
New Haven, Conn	9.0	9.2	9.6	9.4	9.5	9.4	9.0	9.7	10.6	11.8	12.6	11.4	12.1	12.5	12.4	11.2	10.4	9.3	8.7	8.5	8.2	8.2	9.0	9.2	10.0
New Orleans, La	5.6	5.8	5.4	5.7	5.8	5.4	5.6	6.2	7.5	9.0	9.0	9.5	10.5	10.3	10.4	10.1	9.4	8.7	7.8	7.4	7.0	6.6	6.2	6.0	7.5
New York, N. Y	15.4	13.8	13.1	12.3	11.9	11.5	13.0	12.7	12.5	12.7	13.0	13.1	13.5	14.3	14.2	13.6	13.9	14.6	14.6	14.9	14.6	14.8	15.3	15.6	13.7
Norfolk, Va	7.0	6.1	6.3	6.7	6.8	6.7	7.8	8.1	9.0	9.2	9.5	9.2	9.4	9.0	9.3	8.9	8.4	7.3	7.1	6.9	7.2	7.7	7.2	7.3	7.8
Northfield, Vt	6.9	6.8	6.9	6.8	5.9	6.5	6.5	7.0	8.0	9.4	10.7	11.3	11.1	11.0	10.3	10.4	10.1	8.2	7.9	7.5	7.8	6.8	6.8	8.1	8.3
North Platte, Nebr	7.4	7.1	7.0	7.3	7.0	6.9	6.1	5.6	6.3	8.5	10.4	10.6	11.4	12.1	12.5	12.1	11.8	11.5	10.0	7.9	7.0	8.1	9.2	8.1	8.8
Oklahoma, Okla	7.4	7.3	7.2	6.6	7.0	6.6	6.5	6.8	7.9	9.0	10.2	10.4	10.2	10.5	10.4	10.7	10.8	10.5	9.8	7.5	6.7	7.0	7.4	6.9	8.4
Omaha, Nebr	6.2	6.2	6.1	6.2	5.8	6.2	6.0	6.7	7.0	8.4	8.6	8.1	8.5	9.6	9.2	9.0	9.3	8.5	7.4	5.7	5.4	5.7	5.7	5.7	7.1
Oswego, N. Y	9.5	9.7	9.6	9.5	9.7	9.2	8.9	9.3	9.5	9.6	10.1	9.6	10.4	10.1	9.8	9.2	8.7	7.7	8.2	9.3	9.9	9.9	9.7	9.7	9.4
Palestine, Tex	6.0	6.4	5.9	5.1	4.5	4.2	4.4	4.2	5.2	6.3	6.6	6.9	7.1	7.1	8.0	8.0	8.1	8.1	7.1	5.7	5.7	5.9	6.2	6.2	6.2
Parkersburg, W. Va	4.0	4.0	3.6	3.4	3.3	3.3	3.5	4.0	4.3	5.3	5.6	6.1	6.6	6.6	7.0	6.9	5.8	5.1	4.4	3.7	3.9	4.3	4.0	4.1	4.7
Pensacola, Fla	7.7	7.3	7.2	8.3	8.5	9.0	9.2	8.8	9.0	9.4	9.2	9.7	10.0	10.0	10.0	9.8	9.0	8.8	8.2	7.0	6.9	6.7	7.2	7.7	8.5

TABLE VII.—*Average wind movement, etc.*—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Philadelphia, Pa	8.8	8.7	8.4	8.2	8.4	8.5	8.4	10.2	10.6	10.6	11.5	11.2	12.2	12.1	12.3	11.5	11.1	10.5	9.4	9.7	9.2	8.4	8.9	9.1	9.9
Phœnix, Ariz	2.9	3.2	3.8	3.2	4.1	3.7	4.2	4.6	4.9	4.4	5.0	5.3	5.6	5.3	5.1	5.0	5.6	6.2	5.4	4.7	3.7	3.4	3.4	3.0	4.4
Pierre, S. Dak	6.7	5.7	6.0	5.5	5.8	6.4	6.5	6.3	7.1	8.3	9.5	10.5	11.8	12.1	11.9	12.0	11.5	11.3	10.5	8.3	7.0	7.1	7.6	7.3	8.4
Pittsburg, Pa	3.4	3.3	3.5	4.0	3.9	3.5	3.9	4.2	4.9	5.4	6.0	6.3	6.7	7.2	7.1	6.9	6.6	6.0	4.9	4.6	4.1	3.5	3.8	3.8	4.9
Port Angeles, Wash	4.6	4.7	4.3	4.1	4.3	4.3	4.3	4.1	4.4	4.3	3.5	2.9	3.1	3.5	4.1	4.1	4.5	4.7	4.4	4.2	4.4	3.8	4.4	4.6	4.2
Port Huron, Mich	9.7	10.2	9.7	9.4	10.2	9.4	9.3	9.0	9.7	10.5	10.6	11.6	12.0	12.8	13.5	13.1	13.1	11.8	10.6	10.2	10.3	10.7	10.4	9.8	10.7
Portland, Me	5.1	6.3	6.3	6.6	6.5	6.4	6.7	7.5	7.7	8.4	8.8	8.6	9.4	9.4	9.1	8.8	8.4	7.4	6.7	6.6	6.4	6.3	6.4	6.2	7.3
Portland, Oreg	7.5	6.9	6.5	6.7	6.7	7.0	6.8	5.8	5.5	5.6	6.4	7.0	7.8	7.6	7.8	9.0	9.5	9.5	9.7	9.3	9.6	9.6	8.8	8.9	7.7
Pueblo, Colo	6.1	6.2	5.1	5.6	5.5	6.0	5.5	5.4	5.4	5.0	5.5	5.9	5.9	6.1	6.2	7.7	8.6	9.1	8.7	8.6	8.7	6.6	6.1	6.8	6.5
Raleigh, N. C	4.0	3.7	3.7	3.8	3.7	3.9	4.3	4.6	5.2	5.7	6.0	6.2	6.6	6.2	6.4	6.5	6.1	5.5	4.5	4.6	4.2	4.1	3.6	3.8	4.9
Rapid City, S. Dak	8.5	7.7	8.0	7.8	7.5	6.7	6.8	7.1	7.1	7.4	8.3	9.6	11.3	11.8	12.0	12.4	12.0	11.5	10.5	8.5	7.0	6.7	7.9	7.6	8.8
Redbluff, Cal	5.2	5.4	5.2	6.0	5.6	6.0	5.1	4.9	4.9	4.3	4.7	6.2	6.3	6.2	6.1	6.2	6.4	6.2	5.9	6.4	5.4	4.7	4.4	4.8	5.5
Rochester, N. Y	5.6	5.5	5.1	5.1	5.5	5.8	5.7	6.1	7.5	7.5	7.6	8.1	8.1	8.3	8.4	8.4	8.1	6.9	6.0	5.8	6.1	6.7	6.8	5.9	6.7
Roseburg, Oreg	1.3	1.4	1.3	1.3	1.3	1.2	1.0	1.5	1.5	1.2	1.5	2.0	2.8	3.1	3.6	4.3	4.8	5.6	6.0	6.6	6.0	4.5	3.0	1.8	2.9
Sacramento, Cal	8.7	7.7	7.3	7.7	7.8	7.6	7.2	6.7	6.9	5.8	5.8	6.0	6.1	6.7	7.0	7.5	7.3	7.8	8.0	7.8	7.2	8.0	8.4	8.4	7.3
St. Louis, Mo	8.5	8.3	7.9	8.6	9.1	9.0	9.0	9.8	9.8	10.0	10.7	11.0	10.9	10.7	11.1	11.6	11.1	11.0	10.2	10.0	9.2	8.9	8.7	9.2	9.8
St. Paul, Minn	5.4	5.2	5.4	5.8	5.6	5.5	5.8	6.3	6.6	7.5	8.2	9.2	9.7	10.1	10.3	10.1	9.8	9.7	8.1	6.9	6.4	6.7	6.3	5.8	7.3
Salt Lake City, Utah	5.7	5.7	5.9	5.8	5.4	5.4	4.9	5.1	4.7	4.4	4.4	6.0	8.8	9.8	10.1	10.6	10.6	10.6	9.7	8.2	6.7	6.2	6.0	6.1	6.9
San Antonio, Tex	6.9	6.3	5.9	5.8	5.5	5.3	5.6	5.2	5.7	6.9	8.0	8.4	9.2	9.2	9.6	9.5	10.0	8.8	8.9	9.2	8.8	9.1	9.0	8.1	7.7
San Diego, Cal	2.0	2.2	2.3	2.4	2.0	2.2	2.2	2.6	2.8	2.5	2.8	3.9	6.5	8.3	9.7	10.7	10.3	9.8	8.6	7.7	5.8	4.0	2.9	2.6	4.9
Sandusky, Ohio	8.7	8.0	7.7	7.7	7.4	7.4	7.9	8.6	8.8	8.9	9.6	9.4	9.6	10.0	9.7	9.2	8.4	8.2	7.2	7.5	7.6	7.6	8.1	8.3	8.4
San Francisco, Cal	11.1	10.2	8.5	7.7	6.9	6.5	6.6	6.3	5.7	6.1	6.5	7.3	7.3	9.4	11.6	14.3	16.5	18.0	18.8	19.0	17.9	14.6	12.5	11.6	10.9
San Luis Obispo, Cal	2.4	2.6	2.5	2.8	2.7	2.9	3.1	3.0	2.8	3.4	4.3	4.9	5.0	5.5	6.8	7.7	7.8	8.1	7.1	6.4	5.5	4.9	3.8	2.9	4.5
Santa Fe, N. Mex	6.1	5.8	5.6	5.2	4.7	4.3	4.0	3.6	3.4	4.1	5.1	5.8	7.5	8.4	8.9	9.5	8.5	8.0	7.8	7.8	6.1	6.1	6.2	5.7	6.2
Sault Ste Marie, Mich	5.9	5.9	6.4	6.0	6.1	6.4	6.4	7.0	8.0	8.8	10.7	10.8	11.7	12.0	12.0	12.5	13.0	12.1	10.1	8.7	7.8	7.3	7.0	6.6	8.7
Savannah, Ga	4.5	4.3	4.3	4.7	4.9	4.7	4.8	5.2	6.5	7.7	8.2	8.7	10.6	9.4	10.1	10.1	9.8	8.8	7.0	6.4	6.0	5.5	5.4	5.0	6.8
Seattle, Wash	2.2	2.0	1.8	1.7	2.2	2.0	2.1	2.3	2.4	2.7	2.6	3.1	3.3	3.7	4.2	4.6	4.9	5.2	4.8	4.3	3.6	3.4	2.9	2.8	3.1
Shreveport, La	6.4	5.9	5.1	5.4	4.8	4.7	4.5	4.3	4.9	6.0	6.2	5.8	6.1	6.8	6.9	7.3	7.7	7.8	6.7	5.1	6.3	6.9	7.3	7.0	6.1
Sioux City, Iowa	8.0	7.9	7.6	7.9	8.4	7.8	7.9	8.1	8.1	10.4	11.6	12.4	12.2	13.2	13.2	13.4	13.1	12.6	10.3	8.9	8.7	8.5	8.0	7.9	9.8
Spokane, Wash	3.5	2.7	2.7	2.7	2.6	2.6	2.5	2.5	1.9	2.6	3.2	3.9	4.6	5.6	6.0	6.6	6.4	6.1	6.0	5.9	5.3	4.5	4.4	3.3	4.1
Springfield, Ill	7.0	7.4	7.6	7.5	7.7	7.7	7.6	8.4	9.2	9.8	10.5	10.5	10.8	11.2	10.7	11.0	9.9	8.9	8.0	7.2	7.7	8.2	7.7	8.1	8.8
Springfield, Mo	9.0	8.9	8.8	8.8	9.1	9.7	9.4	9.1	9.9	10.9	10.7	10.6	10.8	10.5	10.1	10.4	10.5	10.0	8.4	8.5	9.2	8.9	9.2	9.3	9.6
Tampa, Fla	4.6	4.3	4.4	4.8	4.5	4.4	5.5	5.8	6.6	6.9	7.2	7.2	7.7	7.6	8.0	8.2	7.4	6.5	5.8	5.4	5.5	5.3	5.0	4.1	6.0
Tatoosh Island, Wash	6.3	6.6	7.3	7.4	7.4	7.8	7.7	8.0	8.0	8.3	8.8	8.8	8.3	9.0	9.0	9.4	9.5	8.9	8.2	8.4	7.4	7.0	6.4	5.7	7.9
Toledo, Ohio	8.6	8.3	7.7	7.4	7.6	7.3	8.1	8.5	9.0	9.7	10.0	10.0	10.4	10.9	11.2	11.4	11.1	9.6	8.6	8.5	8.5	8.4	9.2	9.3	9.1
Vicksburg, Miss	5.6	5.6	5.6	5.7	5.5	5.8	5.5	5.1	5.5	5.6	5.3	5.9	7.1	7.1	7.4	7.3	6.9	6.4	5.6	5.2	5.7	5.6	6.0	5.8	6.0
Vineyard Haven, Mass	7.5	8.0	8.9	9.1	9.5	9.6	10.0	11.5	11.7	11.5	11.8	12.1	11.4	11.5	11.4	11.0	10.1	9.4	9.2	8.8	8.8	8.8	8.1	7.9	9.9
Walla Walla, Wash	4.8	5.0	4.6	4.7	4.5	4.3	4.2	4.2	4.4	3.8	3.8	4.9	5.5	6.2	5.9	6.1	6.4	6.6	6.2	5.7	5.2	5.2	5.3	5.2	5.1
Washington, D. C	4.7	5.2	4.4	4.3	4.1	4.2	4.4	5.0	6.7	7.2	7.2	7.4	8.1	8.3	8.4	8.6	7.7	6.6	5.6	5.2	4.5	4.9	5.3	5.6	6.0
Wichita, Kans	7.6	7.3	7.1	7.0	6.8	6.9	6.7	6.8	7.4	8.6	9.6	9.9	9.4	10.0	10.1	10.0	10.1	10.0	8.3	7.6	7.0	7.2	7.4	7.3	8.2
Williston, N. Dak	5.3	5.6	5.6	4.9	5.1	5.4	5.0	4.8	5.0	6.3	7.9	9.7	10.6	11.4	11.8	12.1	12.5	12.0	11.4	9.0	7.0	6.2	5.9	5.9	7.8
Wilmington, N. C	5.4	6.1	5.6	5.7	5.4	5.7	5.5	6.5	7.7	8.0	8.5	8.9	10.3	10.8	11.0	11.1	10.8	9.9	8.2	7.7	6.6	6.3	5.8	5.4	7.6
Winnemucca, Nev	9.1	9.6	9.8	9.5	9.9	10.3	8.8	8.5	9.0	9.0	9.0	9.4	8.4	8.5	8.9	9.2	10.1	9.8	9.8	9.3	8.9	7.5	7.2	7.8	9.1
Woods Hole, Mass	12.5	13.3	14.4	14.9	15.1	14.9	15.4	17.6	17.4	16.9	17.3	17.8	16.2	16.2	15.9	16.4	16.1	14.2	13.5	12.8	13.2	13.9	13.4	12.6	15.1
Yuma, Ariz	4.7	3.8	3.2	3.2	3.3	2.3	2.9	2.7	3.0	3.6	5.0	6.5	7.1	7.4	7.2	6.4	6.6	6.8	6.5	7.1	7.1	6.0	5.7	5.5	5.1

TABLE VIII.—*Heights of rivers above low-water mark, September*, 1896.

Stations.	Distance to mouth of river.	Danger-point on gauge.	Highest water.		Lowest water.		Me'n stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn	2,057	14.0	2.3	17-19	1.3	6	1.9	1.0
La Crosse, Wis	1,867	10.0	1.7	25-27	1.1	3, 9, 10	1.4	0.6
Dubuque, Iowa	1,759	15.0	2.1	15	0.7	6-9	1.2	1.4
Davenport, Iowa	1,653	15.0	2.6	17	0.8	8-14	1.4	1.8
Keokuk, Iowa	1,523	14.0	3.6	20	0.5	9, 10, 14-16	1.6	3.1
Hannibal, Mo	1,462	17.0	5.9	20, 21	1.0	10, 11	2.6	4.9
St. Louis, Mo	1,321	30.0	10.5	23, 24	5.5	13, 14	7.6	5.0
Memphis, Tenn	910	33.0	8.0	1	1.8	20	4.1	6.2
Helena, Ark	834	37.0	13.5	1	4.1	20-23	7.5	9.4
Arkansas City, Ark	702	42.0	13.7	1	3.1	22, 23	7.0	10.6
Greenville, Miss	662	40.0	11.6	1	2.9	23	6.2	8.7
Vicksburg, Miss	541	41.0	12.2	1	1.0	25, 26	5.7	11.2
New Orleans, La	108	13.0	5.3	2	3.2	20	4.0	2.1
Missouri River.								
Pierre, S. Dak.*	1,132	13.0	3.2	2	2.0	15, 27	2.4	1.2
Sioux City, Iowa	802	18.7	5.8	1, 6	4.9	23, 24, 30	5.3	0.9
Omaha, Nebr	667	18.0	8.1	1	7.4	26-30	7.7	0.7
Kansas City, Mo	386	21.0	10.2	1	7.7	29, 30	8.4	2.5
Ohio River.								
Parkersburg, W. Va	786	38.0	7.1	30	3.1	10, 11	4.0	4.0
Catlettsburg, Ky	652	50.0	5.5	30	2.3	15	3.6	3.2
Cincinnati, Ohio	500	45.0	9.3	1	5.5	25	6.7	3.8
Louisville, Ky	368	24.0	5.7	1	3.5	14	4.4	2.2
Evansville, Ind	184	30.0	8.5	1	2.9	22	4.3	5.6
Paducah, Ky	47	40.0	6.6	1, 2	1.6	24-27	3.1	5.0
Cairo, Ill	1,140†	40.0	13.3	1	5.6	16	8.4	7.7
Monongahela River.								
Pittsburg, Pa	966‡	22.0	6.7	22	5.3	25	5.9	1.4
Great Kanawha River.								
Charleston, W. Va	61	30.0	5.1	9	4.1	13	4.7	1.0
Big Sandy River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Louisa, Ky	26	....	5.1	1	3.2	20	4.0	1.9
Wabash River.								
Mount Carmel, Ill	50	15.0	6.2	1	2.0	28	3.0	4.2
Cumberland River.								
Burnside, Ky	404	50.0	1.4	7	0.2	16, 29	0.8	1.2
Nashville, Tenn	145	40.0	2.2	30	0.7	24-27	1.1	1.5
Tennessee River.								
Knoxville, Tenn	640	29.0	......	......	......	......	......	......
Chattanooga, Tenn	455	33.0	2.8	9	1.2	21, 22	1.8	1.6
Johnsonville, Tenn	94	21.0	2.5	4	0.3	27	1.1	2.2
Arkansas River.								
Fort Smith, Ark	351	22.0	2.5	21	1.2	19, 20	1.5	1.3
Little Rock, Ark	176	23.0	3.6	1, 2	2.8	17-21	3.1	0.8
Red River.								
Shreveport, La	449	29.2	— 2.7	1	— 3.3	23-25	—3.0	0.6
James River.								
Lynchburg, Va	251	18.0	18.2	30	— 0.1	14, 15, 24-27	0.6	18.3
Congaree River.								
Columbia, S. C	....	15.0	3.9	6	0.6	2	1.3	3.3
Savannah River.								
Augusta, Ga	140	32.6	11.2	7	3.8	22, 23	4.8	7.4
Alabama River.								
Montgomery, Ala	215	48.0	3.5	24	— 1.5	21	—0.5	5.0
Willamette River.								
Portland, Oreg	....	15.0	5.2	9	1.8	30	3.8	3.4
Sacramento River.								
Redbluff, Cal	....	20.0	0.6	20-23	0.3	6-19	0.4	0.3
Sacramento, Cal	....	28.0	9.8	3	9.0	16-19	9.4	0.8

*Beginning with July 7, 1896, all readings made from the Fort Pierre gauge. †To mouth of Mississippi River. ‡To mouth of Ohio River.

TABLE IX.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during September, 1896.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
New England.						
Eastport, Me	16	24	6	22	s. 63 w.	18
Portland, Me	20	19	6	25	n. 87 w.	19
Northfield, Vt	15	39	3	7	s. 9 w.	24
Boston, Mass	20	19	13	26	n. 86 w.	13
Nantucket, Mass	17	26	15	18	s. 18 w.	10
Woods Hole, Mass.*	9	13	5	8	s. 37 w.	5
Block Island, R. I	16	18	17	26	s. 77 w.	9
New Haven, Conn	27	20	6	14	n. 49 w.	11
Middle Atlantic States.						
Albany, N. Y	19	26	8	14	s. 41 w.	9
New York, N. Y	19	24	13	21	s. 58 w.	9
Harrisburg, Pa	20	9	21	19	n. 10 e.	11
Philadelphia, Pa	21	22	13	15	s. 63 w.	2
Baltimore, Md	20	22	19	16	s. 56 e.	4
Washington, D. C	21	23	13	18	s. 68 w.	5
Lynchburg, Va	16	11	25	13	n. 67 e.	13
Norfolk, Va	20	18	23	15	n. 76 e.	8
South Atlantic States.						
Charlotte, N. C	20	15	33	9	n. 78 e.	24
Hatteras, N. C	27	12	25	11	n. 41 e.	20
Kittyhawk, N. C	20	18	30	10	n. 84 e.	20
Raleigh, N. C	23	19	19	12	n. 60 e.	8
Wilmington, N. C	19	21	23	10	s. 81 e.	13
Charleston, S. C	21	17	27	10	n. 77 e.	18
Augusta, Ga	19	19	27	9	e.	18
Savannah, Ga	21	13	23	12	n. 54 e.	14
Jacksonville, Fla	24	13	29	8	n. 62 e.	24
Florida Peninsula.						
Jupiter, Fla	22	11	27	12	n. 54 e.	19
Key West, Fla	16	16	33	9	e.	24
Tampa, Fla	32	6	35	6	n. 48 e.	39
Eastern Gulf States.						
Atlanta, Ga	17	10	28	18	n. 55 e.	12
Pensacola, Fla	23	18	20	15	n. 45 e.	7
Mobile, Ala	28	17	12	13	n. 5 w.	11
Montgomery, Ala	18	15	25	18	n. 67 e.	8
Vicksburg, Miss	16	22	26	12	s. 67 e.	15
New Orleans, La	22	18	34	7	n. 82 e.	27
Western Gulf States.						
Shreveport, La	11	28	32	6	s. 57 e.	31
Fort Smith, Ark	17	11	36	5	n. 79 e.	32
Little Rock, Ark	16	24	24	13	s. 54 e.	14
Corpus Christi, Tex	14	25	29	10	s. 60 e.	22
Galveston, Tex	11	35	20	7	s. 28 e.	27
Palestine, Tex	16	28	23	9	s. 49 e.	18
San Antonio, Tex	22	23	25	4	s. 87 e.	[illegible]
Ohio Valley and Tennessee.						
Chattanooga, Tenn	21	14	21	19	n. 16 e.	7
Knoxville, Tenn	23	4	19	24	n. 15 w.	20
Memphis, Tenn	21	23	17	8	s. 77 e.	9
Nashville, Tenn	27	15	11	22	n. 43 w.	16
Lexington, Ky	19	23	18	16	s. 27 e.	4
Louisville, Ky	20	23	17	14	s. 45 e.	4
Indianapolis, Ind	20	24	19	10	s. 66 e.	10
Cincinnati, Ohio	19	17	23	11	n. 81 e.	12
Columbus, Ohio	19	18	21	12	n. 84 e.	9
Pittsburg, Pa	12	20	13	25	s. 56 w.	14
Parkersburg, W. Va	15	22	16	15	s. 8 e.	7
Lower Lake Region.						
Buffalo, N. Y	11	23	15	24	s. 37 w.	15
Oswego, N. Y	14	30	17	10	s. 24 e.	18
Rochester, N. Y	13	25	13	26	s. 47 w.	18
Erie, Pa	17	25	15	20	s. 32 w.	9
Cleveland, Ohio	14	28	22	12	s. 36 e.	17
Sandusky, Ohio	15	16	20	22	s. 63 w.	2
Toledo, Ohio	18	21	14	23	s. 72 w.	10
Detroit, Mich	22	15	13	23	n. 55 w.	12
Upper Lake Region.						
Alpena, Mich	21	18	14	22	n. 69 w.	8
Grand Haven, Mich	23	20	16	16	s.	3
Marquette, Mich	20	21	9	26	s. 87 w.	17
Port Huron, Mich	17	24	11	18	s. 45 w.	10
Sault Ste. Marie, Mich	18	18	22	15	e.	7
Chicago, Ill	26	18	10	18	n. 45 w.	11
Milwaukee, Wis	28	14	12	17	n. 20 w.	15
Upper Lake Region—Cont'd.						
Greenbay, Wis	14	23	11	19	s. 42 w.	12
Duluth, Minn	27	13	9	30	n. 56 w.	25
North Dakota.						
Moorhead, Minn	29	21	4	13	n. 48 w.	12
Bismarck, N. Dak	30	12	17	17	n.	18
Williston, N. Dak	28	11	12	20	n. 25 w.	19
Upper Mississippi Valley.						
St. Paul, Minn	15	24	16	22	s. 34 w.	11
La Crosse, Wis.†	11	14	1	8	s. 67 w.	8
Davenport, Iowa	20	15	19	15	n. 39 e.	6
Des Moines, Iowa	23	17	19	14	n. 40 e.	8
Dubuque, Iowa	23	19	14	16	n. 27 w.	4
Keokuk, Iowa	27	15	16	15	n. 5 e.	12
Cairo, Ill	17	25	15	10	s. 32 e.	9
Springfield, Ill	25	16	16	11	n. 29 e.	10
Hannibal, Mo	28	16	16	14	n. 9 e.	12
St. Louis, Mo	20	21	16	11	s. 79 e.	5
Missouri Valley.						
Columbia, Mo.*	16	6	10	7	n. 17 e.	10
Kansas City, Mo	21	14	28	8	n. 71 e.	21
Springfield, Mo	23	23	21	9	e.	12
Omaha, Nebr	27	20	17	11	n. 41 e.	9
Sioux City, Iowa†	13	10	6	5	n. 18 e.	3
Pierre, S. Dak	23	18	18	11	n. 54 e.	9
Huron, S. Dak	22	20	17	18	n. 27 w.	2
Northern Slope.						
Havre, Mont	23	11	12	29	n. 55 w.	21
Miles City, Mont	23	15	10	23	n. 58 w.	15
Helena, Mont	20	14	5	36	n. 79 w.	32
Rapid City, S. Dak	20	21	10	21	s. 85 w.	11
Cheyenne, Wyo	22	23	8	21	s. 86 w.	13
Lander, Wyo	19	19	13	27	w.	14
North Platte, Nebr	17	23	18	17	s. 9 e.	6
Middle Slope.						
Denver, Colo	23	18	13	17	n. 39 w.	6
Pueblo, Colo	21	18	25	17	n. 69 e.	8
Concordia, Kans	19	25	18	10	s. 53 e.	10
Dodge City, Kans	18	24	29	5	s. 76 e.	25
Wichita, Kans	27	20	20	4	n. 66 e.	18
Oklahoma, Okla	22	25	18	9	s. 72 e.	10
Southern Slope.						
Abilene, Tex	19	29	14	11	s. 17 e.	10
Amarillo, Tex	15	36	5	10	s. 13 w.	22
Southern Plateau.						
El Paso, Tex	11	8	33	19	n. 78 e.	14
Santa Fe, N. Mex	13	24	24	17	s. 32 e.	13
Phœnix, Ariz	2	27	10	29	s. 37 w.	31
Yuma, Ariz	18	21	14	19	s. 59 w.	6
Middle Plateau.						
Carson City, Nev	16	18	10	29	s. 84 w.	19
Winnemucca, Nev	17	15	20	18	n. 45 e.	3
Salt Lake City, Utah	17	17	24	19	w.	5
Northern Plateau.						
Baker City, Oreg	17	34	3	16	s. 38 w.	22
Idaho Falls, Idaho	23	29	5	14	s. 56 w.	11
Spokane, Wash	20	17	17	17	n.	3
Walla Walla, Wash	13	22	17	19	s. 13 w.	9
North Pacific Coast Region.						
Fort Canby, Wash	31	15	11	16	n. 17 w.	17
Port Angeles, Wash.*	2	4	10	13	s. 56 w.	4
Seattle, Wash	23	22	13	13	n.	1
Tatoosh Island, Wash	15	22	27	8	s. 70 e.	20
Portland, Oreg	32	11	7	29	n. 46 w.	30
Roseburg, Oreg	31	9	13	19	s. 15 w.	23
Middle Pacific Coast Region.						
Eureka, Cal	21	18	7	26	n. 81 w.	19
Redbluff, Cal	21	20	20	20	n.	1
Sacramento, Cal	17	31	9	19	s. 36 w.	17
San Francisco, Cal	2	10	2	52	s. 81 w.	51
South Pacific Coast Region.						
Fresno, Cal	31	2	5	40	n. 50 w.	46
Los Angeles, Cal	15	11	17	30	n. 73 w.	14
San Diego, Cal	25	7	9	33	n. 53 w.	30
San Luis Obispo, Cal	26	9	5	27	n. 52 w.	28

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE X.—*Thunderstorms and auroras, September, 1896.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	53	T.											1	2	1		1	2				1	1											9	7	T.
		A.																																0	0	A.
Arizona	2	T.	1							1	1	2										1												6	5	T.
		A.																																0	0	A.
Arkansas	51	T.			3	5	4		5	1			4	2	2						2						2	2	2					34	12	T.
		A.																																0	0	A.
California	197	T.		1	1	2	10	2	2													2	1	6						6				33	10	T.
		A.																																0	0	A.
Colorado	70	T.	5	4	11	2		1	5	4	3		1	2					6	6	2		8	3	6	2	1							72	18	T.
		A.																																0	0	A.
Connecticut	22	T.			11			8									1		3		15				1									39	6	T.
		A.																																0	0	A.
Delaware	6	T.			2		3	1											2		4													12	5	T.
		A.				1				1																								2	2	A.
Dist. of Columbia	4	T.			1												1			1	1													4	4	T.
		A.																																0	0	A.
Florida	38	T.	3	7	4	1	4	6	10	6	1		1	2	13	7	7	4	2	2	5	4	1	6	2	1				6	5	1		111	26	T.
		A.																																0	0	A.
Georgia	49	T.					2	1					3	1	2	1		1	1		3	1		1										17	11	T.
		A.																																0	0	A.
Idaho	36	T.			1								1										1	7	4									14	5	T.
		A.																																0	0	A.
Illinois	97	T.		12	9	5	10			5	3	1	4	12	19	13	4	11	14	14	6					1	2	11		1				157	20	T.
		A.													1												1							2	2	A.
Indiana	48	T.		1	5		3				1			5	2	9	7		3	8	6							4	1					55	13	T.
		A.																				1												1	1	A.
Indian Territory	6	T.																																0	0	T.
		A.																																0	0	A.
Iowa	101	T.	1	6	1	6				8	6	1		3	2	12	1	14		1						5	1	3						71	16	T.
		A.																																0	0	A.
Kansas	73	T.	1	6		7		6	5	7	8	2	1		3	8			2	4						10	1	4						75	16	T.
		A.																																0	0	A.
Kentucky	47	T.			2	3	2	1					1		2		3		3	2	1								1					21	11	T.
		A.																																0	0	A.
Louisiana	48	T.	1	2	4	2	7		3		1	4	8	7	1		1	3	4	6	1		1	1			1							58	19	T.
		A.																																0	0	A.
Maine	16	T.	1		3			8						2			1		1		3													19	7	T.
		A.				1		1												1														3	3	A.
Maryland	31	T.			9		6	3				1	3	2	6	3	3	1	2	11	15										1			66	14	T.
		A.																																0	0	A.
Massachusetts	77	T.			30		2	21	1									1	14	2	30											1		102	9	T.
		A.																																0	0	A.
Michigan	96	T.		7	1	2	6	1			5		1	6	1	2			2	1								6	1		1	1		44	16	T.
		A.			1																	1										3		5	3	A.
Minnesota	69	T.	6	3	1	2				8		1		1	5	7	3	18								2	2							59	18	T.
		A.		1	1		1	1	1										2	3		1		2						1		1		15	11	A.
Mississippi	52	T.			1		1						5	4		1																		12	5	T.
		A.																																0	0	A.
Missouri	96	T.		13	4	26	4	1	8	25	16	7	7	13	10	11	5	9	4	25	7				1	8	3	26	3	1	1			238	25	T.
		A.																																0	0	A.
Montana	40	T.															2								1									3	2	T.
		A.																																0	0	A.
Nebraska	112	T.		9		6	1	2	2	2	4	2			5	2		2		3					1	1		2						44	15	T.
		A.																																0	0	A.
Nevada	39	T.				1	2	3	1												1		1	1										10	7	T.
		A.																																0	0	A.
New Hampshire	23	T.			9			6						3							3													21	4	T.
		A.				4												1																5	2	A.
New Jersey	54	T.			17		4	11					1		2		1	1	16	6	21													80	10	T.
		A.																																0	0	A.
New Mexico	36	T.	3	3	2		1	3	1				2	1					4	1	1		1		1						1	1		26	15	T.
		A.																																0	0	A.
New York	93	T.		1	12		1	6						4	1	1	2	1	16	4	16													65	12	T.
		A.																																0	0	A.
North Carolina	60	T.	1	3	14	8	14	5	1			1	10	7	8	1	10	14	5		13	5		2	1						3	1		127	21	T.
		A.																																0	0	A.
North Dakota	39	T.	4							1				3		2	1																	11	5	T.
		A.																	2	1		1			1				1			4		10	6	A.
Ohio	140	T.			5		19	1					1	19	1	4	7		2	27	19							3		1				109	13	T.
		A.					1					1		1						1														4	4	A.
Oklahoma	20	T.				1		1			1	1	1	3							1	1				1								11	9	T.
		A.																																0	0	A.
Oregon	60	T.						1					1	7		1																		10	4	T.
		A.																																0	0	A.
Pennsylvania	93	T.			9		7	1					2	10		5	3	2	22	13	26			2	1						2			105	14	T.
		A.																																0	0	A.
Rhode Island	6	T.			4	1											1		2	1	5													14	6	T.
		A.																		1														1	1	A.
South Carolina	42	T.	2	1	1	6	5						3		1	1		6		1	7	4	1	6							1			46	16	T.
		A.																																0	0	A.
South Dakota	46	T.	7	3	2	3									3	2	2	2								4								28	9	T.
		A.																	1	1	1											2		5	4	A.
Tennessee	49	T.		3	6	1	4						6	3	2				1	1	6													33	10	T.
		A.																																0	0	A.
Texas	91	T.	4	3	2	2	4	3		1	2	2	6	6	2	2	1			3	3	2				4	7	4	2					65	21	T.
		A.																																0	0	A.
Utah	32	T.	1				3	2	4	6	2										3	2		4	1									28	10	T.
		A.																																0	0	A.
Vermont	13	T.			4	1		5						3	1				6															20	6	T.
		A.				1											1																	2	2	A.
Virginia	37	T.			11	1	1	3				1	3		3	4	7			5	14										1			54	12	T.
		A.																		1														1	1	A.
Washington	51	T.											1	4			1																	6	3	T.
		A.																																0	0	A.
West Virginia	37	T.		1	5	1	3	1					5	5	2	4	5	1	1	2	7													43	14	T.
		A.																																0	0	A.
Wisconsin	58	T.	3	12		1	3				8	1		5	3	7		1								1	2							47	12	T.
		A.			1																							1						2	2	A.
Wyoming	11	T.	1	2	1					2															1		1							8	6	T.
		A.																																0	0	A.
Sums	2,713	T.	45	103	208	96	136	114	48	77	62	27	83	147	103	110	81	94	138	150	247	23	16	39	21	40	23	65	10	15	16	5	....	2,342	....	T.
		A.	0	1	3	7	2	2	1	1	0	1	0	1	1	0	1	1	5	9	1	4	0	2	1	0	1	1	1	1	0	10	....	58	....	A.

TABLE XI.—*Hourly sunshine as deduced from sunshine recorders, September, 1896.*

Stations.	Instrument.	Percentages for each hour of local mean time ending with the respective hour.																Monthly summary.			
		A. M.								P. M.								Instrumental record.			Personal estimate.
		5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	Actual.	Possible.	Per cent of possible.	
																		Hours.	*Hours.*		
Atlanta, Ga	T.	......	43	37	48	56	68	85	76	80	74	69	61	53	43	45	......	230.0	381.8	62	65
Baltimore, Md	T.	......	43	39	39	52	60	67	71	65	65	60	57	41	34	45	......	201.0	373.4	54	50
Bismarck, N. Dak	P.	......	29	38	55	59	59	61	61	56	59	61	63	61	60	64	......	214.9	376.9	57	56
Boston, Mass	T.	......	30	41	51	53	52	64	63	59	60	54	49	45	36	10	......	191.4	374.5	51	42
Buffalo, N. Y	T.	......	33	29	42	61	63	68	67	66	69	65	57	52	40	57	......	209.8	375.0	56	42
Cheyenne, Wyo	P.	......	44	48	51	56	65	67	67	69	65	69	63	60	51	57	......	226.5	374.0	61	45
Chicago, Ill	T.	......	34	30	45	49	65	66	73	77	71	67	58	49	31	34	......	208.7	374.5	56	45
Cincinnati, Ohio	T.	......	68	60	63	66	68	70	69	65	80	77	74	70	51	65	......	252.4	373.4	68	49
Cleveland, Ohio	P.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	39
Columbus, Ohio	T.	......	24	23	24	39	53	60	61	59	50	48	33	15	7	9	......	144.5	373.6	39	32
Denver, Colo	P.	......	23	41	71	78	78	76	71	68	73	73	68	56	23	23	......	236.3	373.6	63	55
Des Moines, Iowa	T.	......	38	44	45	55	58	57	61	60	55	49	46	46	46	49	......	192.4	374.5	51	48
Detroit, Mich	T.	......	36	37	36	39	53	74	81	78	71	71	64	54	45	39	......	215.7	374.5	58	48
Dodge City, Kans	P.	......	53	56	63	62	69	72	71	69	71	67	70	67	60	45	......	245.6	373.0	66	58
Dubuque, Iowa	T.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	39
Eastport, Me	P.	......	20	25	26	36	39	45	47	50	50	56	48	47	33	15	......	156.5	375.8	42	31
Eureka, Cal	P.	......	15	18	29	40	50	57	60	64	63	61	54	48	41	41	......	178.8	374.0	48	44
Fresno, Cal	T.	......	82	77	77	80	86	97	96	97	93	94	91	82	80	98	......	326.5	372.6	88	82
Galveston, Tex	P.	......	13	36	72	77	77	76	83	78	84	84	83	75	52	16	......	264.0	370.4	71	63
Helena, Mont	P.	......	47	53	54	60	58	63	58	59	70	68	64	59	60	57	......	226.2	376.9	60	54
Kansas City, Mo	P.	......	33	36	43	50	56	61	66	62	58	59	55	48	41	49	......	195.7	373.4	52	47
Little Rock, Ark	T.	......	71	67	68	70	75	83	82	81	76	78	72	66	62	67	......	272.2	372.0	73	61
Louisville, Ky	T.	......	52	50	51	51	59	64	63	67	68	67	66	53	45	51	......	218.1	373.0	58	48
Minneapolis, Minn	T.	......	29	34	49	44	45	54	61	71	72	64	60	49	45	31	......	199.1	375.8	53	......
New Orleans, La	T.	......	28	33	60	70	78	84	83	78	70	67	60	44	21	22	......	227.2	370.8	61	61
New York, N. Y	T.	......	12	13	27	45	66	68	67	67	65	60	51	45	29	38	......	184.0	374.0	49	48
Northfield, Vt	P.	......	10	12	27	38	55	57	57	48	55	54	48	49	34	35	......	162.2	375.4	43	37
Omaha *	P.	......	40	45	59	65	66	68	69	66	64	63	64	59	50	49	......	211.5	347.8	61	52
Philadelphia, Pa	T.	......	61	50	54	63	68	69	69	68	79	80	72	57	46	48	......	239.6	373.6	64	47
Phœnix, Ariz	P.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	72
Portland, Me	T.	......	3	23	51	52	60	68	68	70	62	56	54	43	22	0	......	188.8	375.4	50	35
Portland, Oreg	T.	......	48	40	42	48	54	66	77	75	77	72	70	69	71	71	......	237.8	376.1	63	65
Do	P.	......	48	40	42	49	56	67	73	75	75	71	71	72	71	71	......	237.6	376.1	63	65
Rochester, N. Y	T.	......	43	30	31	40	45	61	59	59	56	52	48	49	54	76	......	183.6	375.0	49	42
St. Louis, Mo	T.	......	30	27	35	51	72	76	74	81	80	80	67	53	41	40	......	225.8	373.4	60	46
Salt Lake City, Utah	P.	......	46	62	83	86	88	91	83	87	90	89	86	77	63	66	......	303.0	374.0	81	52
San Diego, Cal	P.	......	27	29	40	61	73	82	92	91	95	95	89	85	83	80	......	279.1	371.4	75	79
San Francisco, Cal	T.	......	0	3	28	46	66	74	80	85	87	90	85	68	39	8	......	225.7	373.0	61	56
Santa Fe, N. Mex	P.	......	48	58	70	72	77	79	72	75	72	72	65	66	48	42	......	253.3	372.2	68	60
Savannah, Ga	P.	......	43	51	79	84	84	79	77	70	76	73	67	63	53	57	......	262.0	371.4	71	72
Vicksburg, Miss	T.	......	71	63	71	83	83	90	91	82	80	80	84	77	71	84	......	294.8	371.4	79	77
Washington, D. C	P.	......	57	50	54	50	59	64	68	62	67	63	67	56	53	58	......	224.0	373.4	60	59
Wilmington, N. C	T.	......	38	47	77	85	91	97	100	94	90	88	84	79	51	36	......	299.3	371.8	81	70

* All instrumental values for 28 days, the personal estimate is for 30 days.

TABLE XII.—*Maximum rainfall in one hour or less, September, 1896.*

Stations.	Maximum rainfall in— 5 min.	Date.	10 min.	Date.	1 hour.	Date.	Stations.	Maximum rainfall in— 5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		*Inch.*		*Inch.*			*Inch.*		*Inch.*		*Inch.*	
Atlanta, Ga	0.10	29	0.14	29	0.48	29	Milwaukee, Wis	0.05	8, 16	0.08	30	0.38	30
Baltimore, Md	0.40	19	0.75	19	1.00	19	Nantucket, Mass	0.05	19	0.10	19	0.27	19
Bismarck, N. Dak	0.09	14	0.09	14	0.15	13	Nashville, Tenn	0.10	12	0.15	12	0.52	28
Boston, Mass	0.22	6	0.28	6	0.71	6	New Orleans, La	0.30	2	0.55	2	1.85	2
Buffalo, N. Y	0.08	15	0.10	15	0.26	30	New York, N. Y	0.23	3	0.27	3	0.47	3
Chicago, Ill	0.36	14	0.57	14	0.98	14	Norfolk, Va	0.24	19	0.40	19	0.63	19
Cincinnati, Ohio	0.12	28	0.19	28	0.69	28	Omaha, Nebr	0.24	10	0.33	10	0.70	10
Cleveland, Ohio	0.15	19	0.20	19	0.25	19	Philadelphia, Pa	0.04	29	0.08	29	0.16	29
Denver, Colo	0.14	3	0.18	3	0.19	3	Pittsburg, Pa	0.11	19	0.15	19	0.30	19
Detroit, Mich	0.26	26	0.45	26	0.77	26	Portland, Me	0.28	6	0.41	6	1.58	6
Dodge City, Kans	0.03	18	0.05	18	0.15	18	Portland, Oreg	0.01	15	0.02	15	0.07	15
Duluth, Minn	0.02	4	0.04	4	0.17	4	Rochester, N. Y	0.11	30	0.14	30	0.25	19
Eastport, Me	0.10	19	0.18	19	0.60	19	St. Louis, Mo	0.10	25	0.18	26	0.35	26
Galveston, Tex	0.41	20	0.60	20	0.74	20	St. Paul, Minn	0.19	16	0.28	16	0.84	16
Indianapolis, Ind	0.35	18	0.60	18	1.78	18	Salt Lake City, Utah	0.01	22	0.02	22	0.10	22
Jacksonville, Fla	0.25	22	0.38	22	0.53	22	San Diego, Cal. †	......	......	......	......	......	......
Jupiter, Fla	0.27	9	0.49	9	1.17	9	San Francisco, Cal	0.02	22	0.04	22	0.22	22
Kansas City, Mo	0.46	26	0.54	26	0.66	26	Savannah, Ga	0.36	29	0.55	29	1.02	29
Key West, Fla	0.17	23	0.30	19	0.99	19	Seattle, Wash	0.04	12	0.07	12	0.28	12
Little Rock, Ark	0.28	25	0.37	25	0.95	25	Vicksburg, Miss	0.01	12	0.02	12	0.06	12
Louisville, Ky	......	......	......	......	0.65*	27	Washington, D. C	0.31	3	0.44	3	0.72	5
Memphis, Tenn	0.20	5	0.31	5	0.58	5	Wilmington, N. C	0.20	22	0.30	22	0.60	22

* Estimated. † Less than 0.05 inch in one hour.

TABLE XIII.—*Excessive precipitation, by stations, for September*, 1896.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Arizona.	*Inches.*	*Inches.*		*Ins.*	*h. m.*	
St. Helena Ranch				1.02	0 40	11
Colorado.						
T. S. Ranch		2.64	22-23			
Connecticut.						
Greenfield Hill		2.83	5-6			
Hartford		2.65	5-6			
North Grosvenor Dale		2.61	5-6			
Norwalk		2.73	5-6			
Southington		3.15	5-6			
Storrs		3.22	5-6			
Delaware.						
Seaford		2.65	5-6			
Florida.						
Grasmere				1.77	1 17	15
Jupiter				1.17	1 00	9
Lake Butler		2.50	3			
Myers	11.12	5.11	2			
Tampa		3.53	14-15			
Georgia.						
Adairsville		3.46	28-29			
Albany				1.80	1 30	20
Augusta				1.00	1 00	9
Camak		3.10	29-30			
Cedartown		2.68	29			
Clayton		8.29	4-5			
Columbus		3.25	21-22			
Hephzibah		2.70	29-30			
Poulan		3.89	28-29			
Rome		2.95	29			
Savannah				1.02	1 00	29
Thomasville		5.10	28-29			
Waycross				1.00	0 40	9
Illinois.						
Albion		2.74	19			
Alexandria				1.50	0 45	16
Aurora		2.64	29-30			
Carlyle		3.16	17			
Dwight		2.84	29-30			
Friendgrove		3.62	18-19			
Greenville		2.80	17			
Griggsville		3.41	16			
Laharpe	12.28	3.00	16			
Mascoutah		2.70	18-19			
Oswego		2.50	29-30			
Ottawa		2.54	11-12			
Do		3.21	29-30			
Plumhill		2.50	19			
Riley		2.93	14			
St. Charles	14.44	2.50	14			
Springfield				1.37	1 00	26
Sycamore		2.71	14			
Indiana.						
Angola		2.50	29-30			
Bright		2 53	28-29			
Indianapolis				1.78	1 00	18
Jasper		3.10	26-27			
Iowa.						
Bonaparte		2.61	16			
Keokuk		2.94	16			
Keosauqua		3.00	16			
Knoxville		2.55	16			
Mooar		2.80	16			
St. Charles				1.05	1 00	14
Sibley		4.13	13-14			
Kansas.						
Fort Riley		2.60	14			
Morantown		2.85	18-19			
Wakefield		3.65	13-14			
Kentucky.						
Catlettsburg		2.65	28-29			
Fords Ferry		2.60	26-27	1.90	1 00	17
Louisville		2.74	27-28			
Marrowbone		2.90	28			
Louisiana.						
Amite		3.51	3-4			
Clinton				1.12	1 05	11
Houma		3.40	3-4			
Lawrence		3.25	2			
Liberty Hill		2.82	25			
Melville				1.00	1 00	18
New Orleans		3.73	2	1.85	1 00	2
Plain Dealing		4.40	25			
Port Eads	10.69	5.22	3-4	2.24	2 00	3
Southern University		3.10	2			
Sugar Experiment Station		3.73	2			
Venice		4.66	2			
West End		3.05	2			
Maine.						
Belfast	10.32	5.61	6			
Calais		2.68	6			
Cornish		2.94	6			
Cumberland Mills		4.85	6			
Fairfield		2.90	5-6			
Gardiner		3.79	6			
Lewiston		3.13	5-6			
Orono		4.34	6			
Portland		5.28	5-6	2.30	1 20	6
Winslow		2.98	6			
Maryland.						
Baltimore				1.00	0 40	19

TABLE XIII.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Maryland—Continued.	*Inches.*	*Inches.*		*Ins.*	*h. m.*	
Chestertown		3.04	5			
Cumberland		3.91	29			
Flintstone		4.90	29-30			
Grantsville		2.50	29			
Green Spring Furnace		3.55	29-30			
Mardela Springs		3.17	5-6			
Princess Anne		3.17	6			
Western Port		4.30	29			
Massachusetts.						
Amherst		2.86	5-6			
Ashland		3.25	5-6			
Attleboro		3.05	10			
Bedford		3.03	6			
Beverly Farms		3.17	5-6			
Blue Hill	10.23	2.84	10			
Boston (V. O.)		2.64	9-10			
Brockton *b*		2.84	9-10			
Brockton *c*		3.25	9-10			
Buzzards Bay		3.25	9-10			
Concord		2.91	6			
Dudley		2.80	6-7			
Framingham		3.04	5-6			
Groton		3.13	5-6			
Hingham		2.63	9-10			
Hobbs Brook		2.95	5-6			
Lake Cochituate		3.60	5-6			
Lawrence		2.71	5-6			
Leominster		2.69	6			
Long Plain		2.98	10			
Lowell		5.29	5-6			
Mansfield	10.85	3.97	9-10			
Milton		3.05	9-10			
Monroe		2.96	5-6			
Mount Nonotuck		2.74	5-6			
Mystic Lake		3.42	5-6			
Natick		3.27	5-6			
New Bedford		3.60	9-10			
Pittsfield		2.80	6			
Quinapoxet		3.05	5-6			
Salem		2.62	5-6			
Somerset		3.11	9-10			
South Clinton		3.68	5-6			
Springfield Armory		3.08	5-6			
Sterling		3.20	5-6			
Taunton		3.74	9-10			
Vineyard Haven		3.15	9-10			
Wakefield		3.50	6			
Waltham		2.93	6			
Webster		2.54	6			
Westboro		3.31	5-6			
Weston		3.18	5-6			
Worcester		3.29	5-6			
Michigan.						
Alpena		2.81	29-30			
Boon		2.80	29-30			
Bronson		2.65	29			
Gaylord		2.62	29-30			
Grayling		2.50	29-30			
Harrison		2.70	29-30			
Harrisville		2.96	29-30			
Lake City		2.75	29			
Lewiston		3.82	29-30			
Owosso		2.58	11-12			
Parkville		3.55	29-30			
Rogers City		2.70	29-30			
Minnesota.						
Long Prairie		2.62	15-16			
Mississippi.						
Enterprise				2.00	1 00	12
Logtown		3.05	2			
Magnolia		3.70	3			
Missouri.						
Brunswick		4.40	11			
Columbia				1.06	0 30	16
Gordonville				1.24	1 00	4
Houstonia (near)				1.84	0 45	14
Lexington		2.50	11			
Marblehill		2.50	4-5			
Princeton				1.08	0 10	16
Sikeston		2.60	27			
Nebraska.						
Kirkwood				1.13	0 30	14
Milford		2.80	10			
Nemaha		2.83	13-14			
Rulo		2.50	18			
Strang		2.75	9-10			
Wilber		2.93	14			
New Hampshire.						
Alstead		2.75	5-6			
Belmont		2.52	6			
Durham		5.75	5-6			
Keene		2.62	6			
Newton		3.26	5-6			
North Conway		3.05	6			
Peterboro		3.00	6			
New Jersey.						
Boonton		3.67	5-6			
Charlotteburg		5.04	5-6			
Chester		4.90	5-6			
Deckertown		3.47	5-6			

TABLE XIII.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
New Jersey—Continued	*Inches.*	*Inches.*		*Ins.*	*h.m.*	
Dover		5.25	5-6			
Franklin Furnace		3.64	5-6			
Junction		4.00	5-6			
Lambertville		2.74	5			
Plainfield				1.46	1 01	3
Sergeantsville		3.39	5-6			
Toms River				1.50	1 00	19
New York.						
Carmel		2.60	5-6			
Elka Park		2.50	29			
Honeymead Brook		4.28	5-6			
Mohonk Lake		3.85	5-6			
Poughkeepsie		3.84	5-6			
Wappingers Falls		4.21	5-6			
Warwick		3.88	6			
North Carolina.						
Chapelhill		3.86	28-29			
Falkland		2.90	29			
Fayetteville		3.84	22-23			
Greensboro		3.85	28-29			
Highlands				1.06	1 00	12
Linville		3.30	29			
Littleton		2.85	16			
Mocksville		2.87	28-29			
Moncure		4.20	28-29			
Monroe		2.50	22			
Morganton		2.88	4			
Mountairy		4.28	28-29			
Oakridge		5.40	28-29			
Salisbury		3.10	28-29			
Saxon		5.05	29			
Settle		3.75	28-29			
Skyuka				1.03	0 30	13
Soapstone Mount		3.60	29			
Southern Pines		2.52	29			
Springhope		2 75	22			
Weldon		2.95	15-16			
North Dakota.						
Power		2.73	14-15			
Ohio.						
Basil		2.97	29			
Canton				1.03	1 00	12
Cardington		2.50	27			
Circleville		2.87	29			
Coalton		3.20	28-29			
Jacksonboro		3.40	27-28			
Lancaster		2.88	29			
Levering		2.92	29			
Ohio State University		2.52	29			
Pataskala		3.00	29			
Urbana				1.86	1 30	12
Oregon.						
Nehalem		2.62	30			
Pennsylvania.						
Altoona		3.38	30			
Bowers Lock		3.33	6			
Cameron		2.70	30			
Centerhall		2.77	29-30			
Coatesville		3.59	5-6			
Confluence				1.75	1 00	15
Driftwood		3.30	29-30			
Easton		2.59	5-6			
Forks of Neshaminy		3.69	5-6			
Hollidaysburg		3.42	29			
Huntingdon		4.00	29-30			
Indiana		2.50	29			
Keating		2.54	29-30			
Pottstown		2.60	5-6			
Quakertown		2.79	5-6			
Shawmont		2.85	5-6			
Somerset		3.10	29			
Swarthmore		3.00	5			
West Chester		2.64	5			
Westtown		3.20	5-6	1.11	0 25	17
Rhode Island.						
Block Island		4.88	9-10			
Bristol		3.18	9-10			
Providence		3.06	9-10	1.05	1 00	9
South Carolina.						
Central		5.06	4-5			
Clemson College		5.77	5			
Edisto		2.58	29			
Little Mountain		2.56	4-5			
Longshore		4.06	29			
St. Georges				1.70	1 30	29
Santuck		2.73	28-29			

TABLE XIII.—*Excessive precipitation.*—Continued.

Stations.	Monthly rainfall 10 inches, or more	Rainfall 2.50 inches, or more, in 24 hours. Amt.	Day.	Rainfall of 1 inch, or more, in one hour. Amt.	Time.	Day.
South Carolina—Continued.	*Inches.*	*Inches.*		*Ins.*	*h.m.*	
Trenton		3.00	28-29			
Walhalla		3.65	4-5			
South Dakota.						
Castlewood		2.53	13			
Tennessee.						
Byrdstown		2.75	28-29			
Carthage		2.59	28-29			
Decatur		3.68	28-29			
Liberty		4.05	27-28			
Texas.						
Abilene		3.58	19-20			
Alice				1.00	0 30	11
Austin		6.30	26			
Ballinger		4.69	19-20			
Blanco	10.06	8.00	26			
Brady		3.01	19-20			
Brownwood		4.96	19-20			
Coleman		2.72	19-20			
College Station		6.83	25-26			
Dublin		2.70	19-20			
Duval		5.16	26			
Fort Clark		3.60	20			
Fort Stockton		3.16	13			
Fredericksburg		4.90	26			
Gainesville				1.67	0 45	25
Georgetown		7.37	25-26			
Golindo	10.30	7.00	25-26			
Hearne		7.11	24-25			
Hewitt		4.50	25-26			
Houston		3.92	25-26			
Kerrville		3.91	26-27			
Leakey		3.20	19			
Do		2.60	26			
Longview		2.60	25			
Lufkin		2.81	25			
Luling		3.62	26-27			
Marathon		2.83	19			
Menardville		3.00	19			
Round Rock		5.75	25			
Runge		2.82	27			
San Antonio		3.90	26-27			
Sanderson		2.50	13			
San Marcos		7.06	25-26			
Stafford		2.94	26			
Sugar Land		5.09	25-26			
Sulphur Springs				1.06	0 30	27
Temple		3.70	25			
Waco		3.30	25-26			
Waxahachie		2.50	25			
Utah.						
Moab		5.00	22-23			
Vermont.						
Jacksonville		3.29	6-7			
Vernon		2.66	6			
Virginia.						
Barboursville		4.20	29-30			
Bedford City		5.65	29-30			
Blacksburg		3.45	28-29			
Buckingham		2.52	29			
Burkes Garden		2.78	29			
Clifton Forge		5.08	28-29			
Dale Enterprise		6.30	29			
Hot Springs		5.36	29-30			
Lexington		4.73	28-29			
Lynchburg		5.79	28-29	2.70	1 30	29
Monterey		6.00	29			
Rockymount		4.25	29-30			
Salem		3.62	28-29			
Stanardsville		4.50	29-30			
Staunton		6.73	28-29			
Stephens City		4.22	29			
Woodstock		6.90	28-29			
West Virginia.						
Beverly		2.60	29			
Bloomery		7.00	29-30			
Bluefield		3.09	29			
Burlington		4.45	29-30			
Fairmont		2.56	30			
Harpers Ferry		3.10	29-30			
Marlinton		2.71	29-30			
Oldfields		4.53	29-30			
Wisconsin.						
Beloit		2.75	14			
Delavan		3.14	13			
Milwaukee		2.56	29-30			
Racine		2.52	29-30			

Chart I. Tracks of Centers of Low Areas. September, 1896.

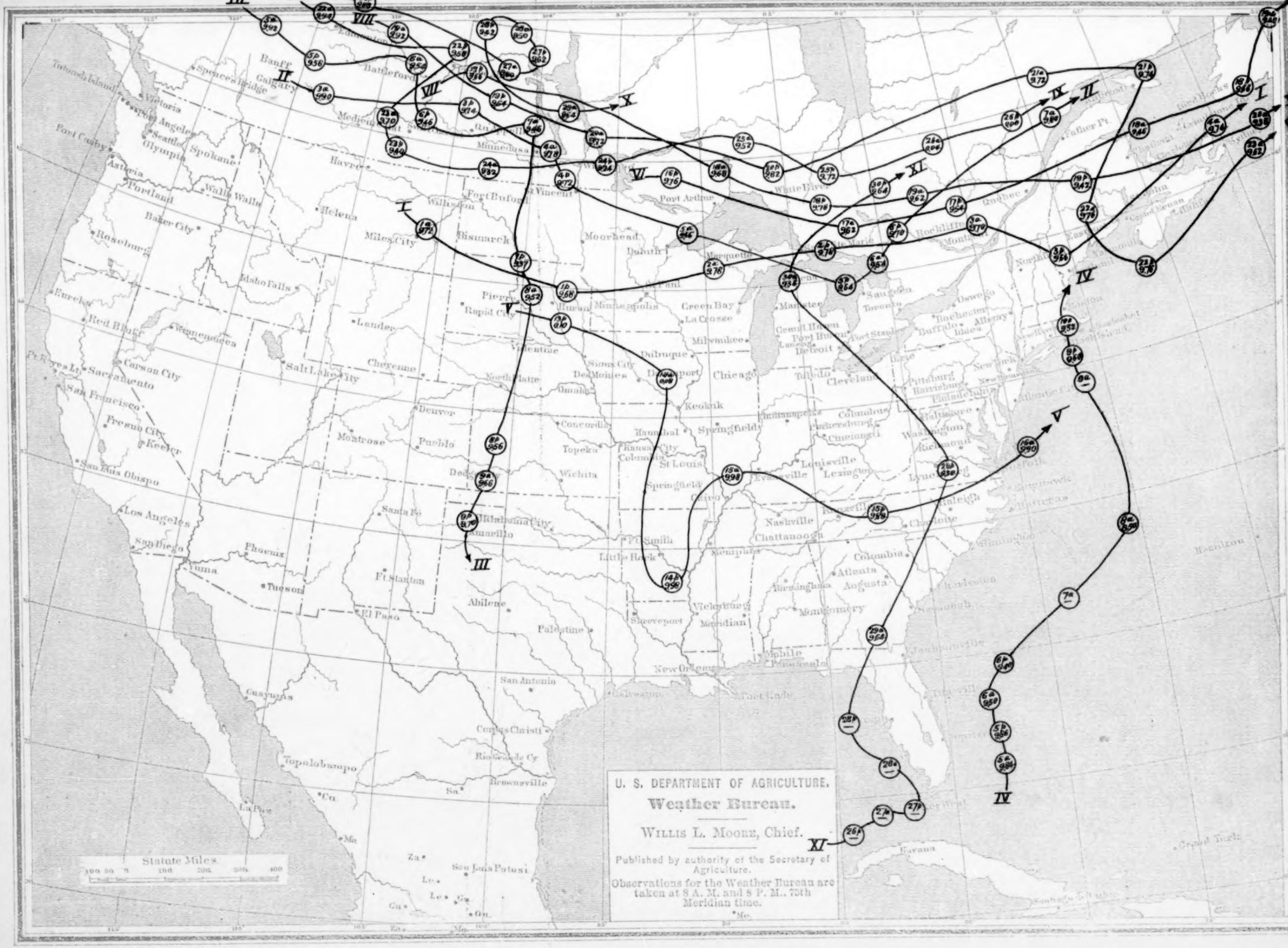


Chart II. Tracks of Centers of High Areas. September, 1896.

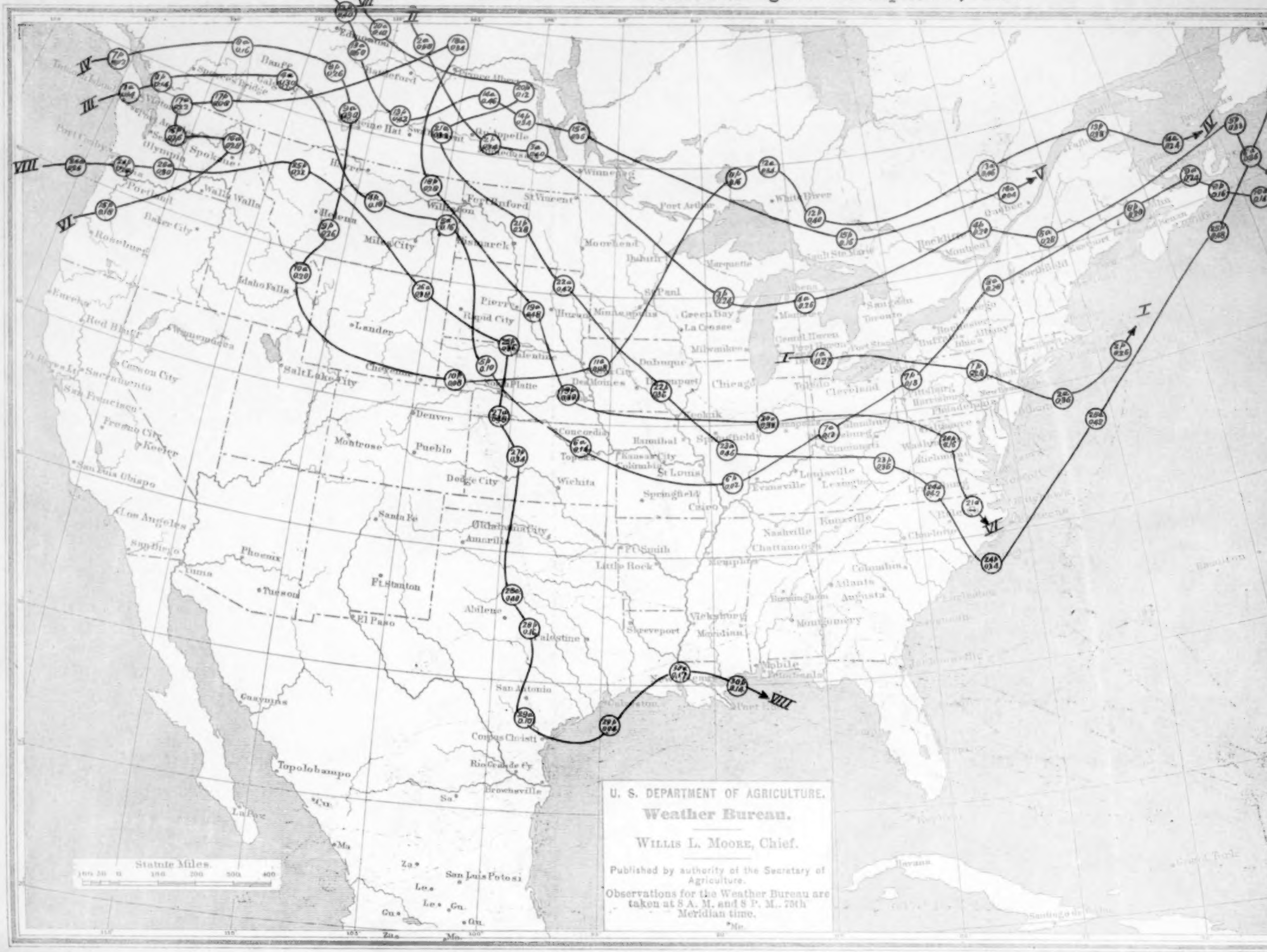


Chart III. Total Precipitation. September, 1896.

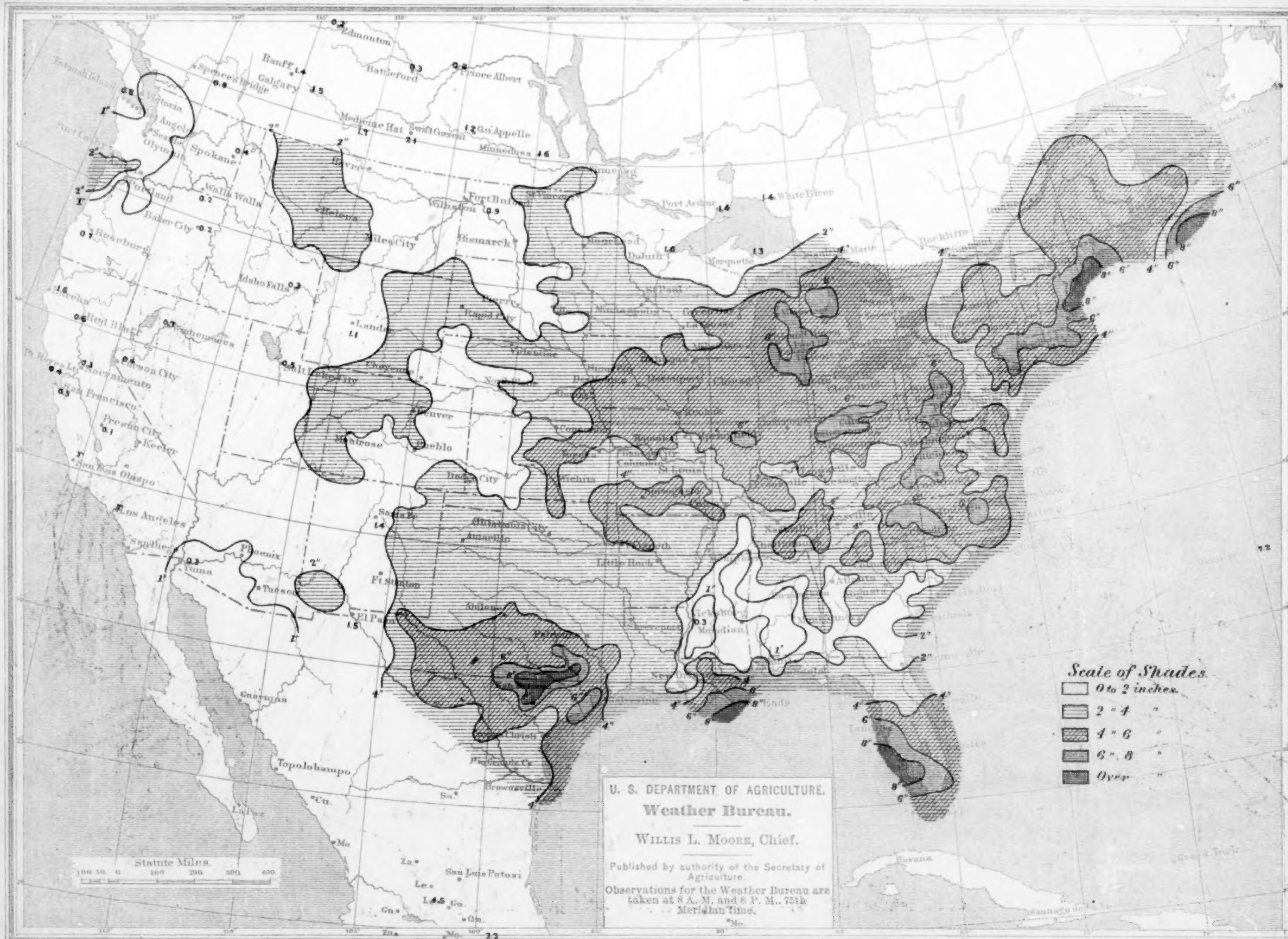


Chart IV. Isobars, Isotherms, and Resultant Winds. September, 1896.

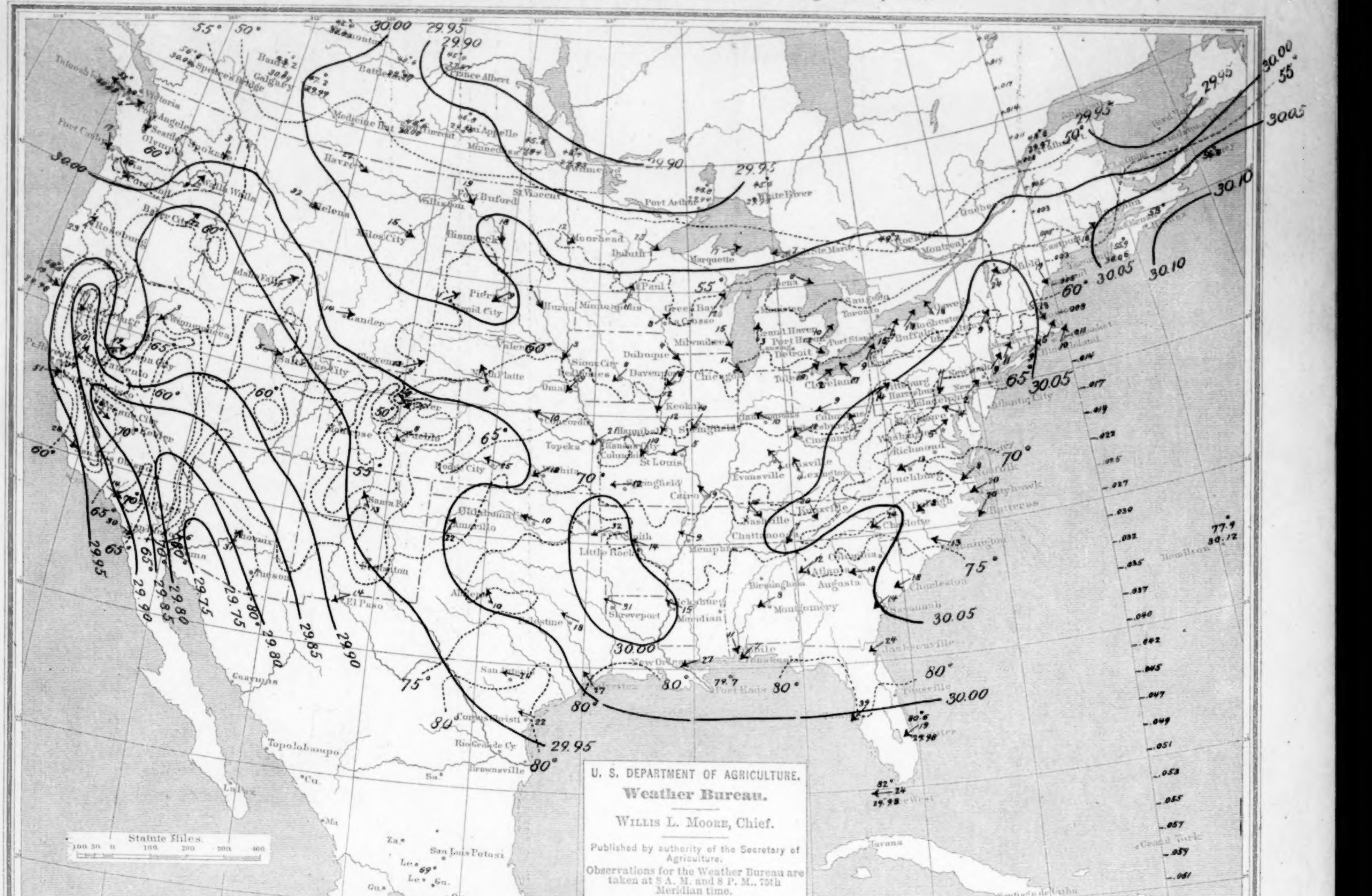


Chart VI. Record by Meteorograph during Kite Ascension of October 8, 1896, at Blue Hill Observatory.

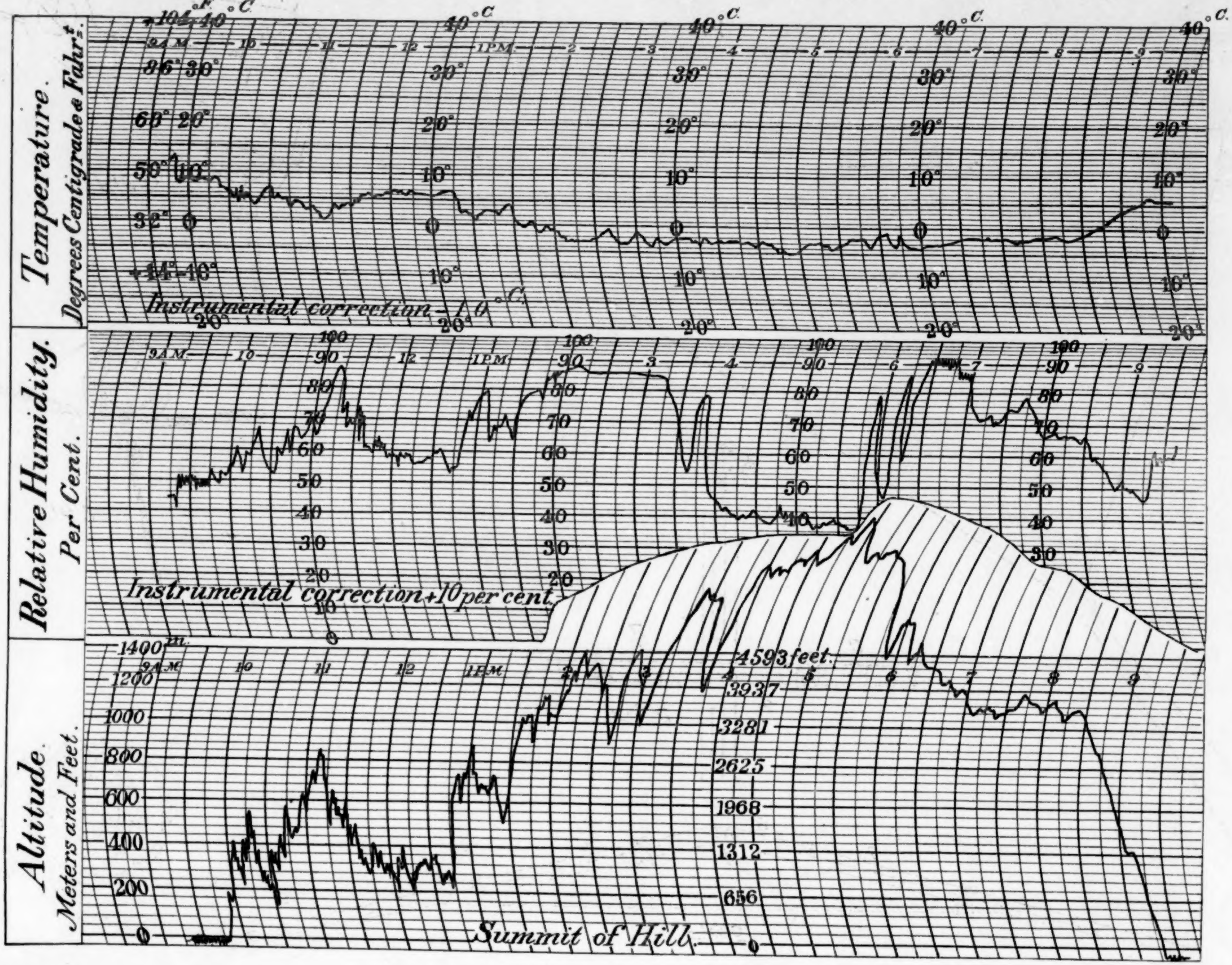


Chart V. Kite Experiments at Blue Hill Observatory.

FIG. 1.

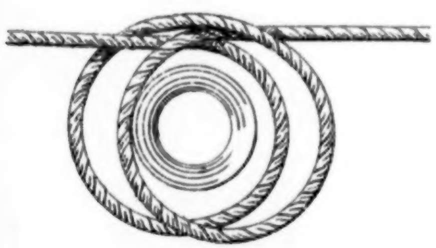


FIG. 5.

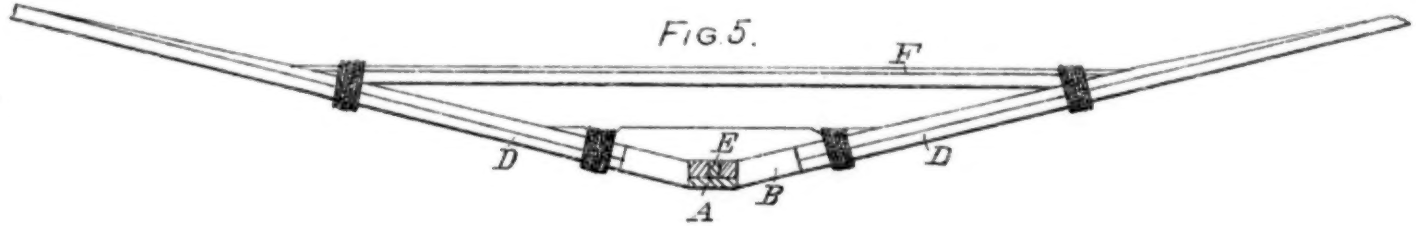


FIG. 4.

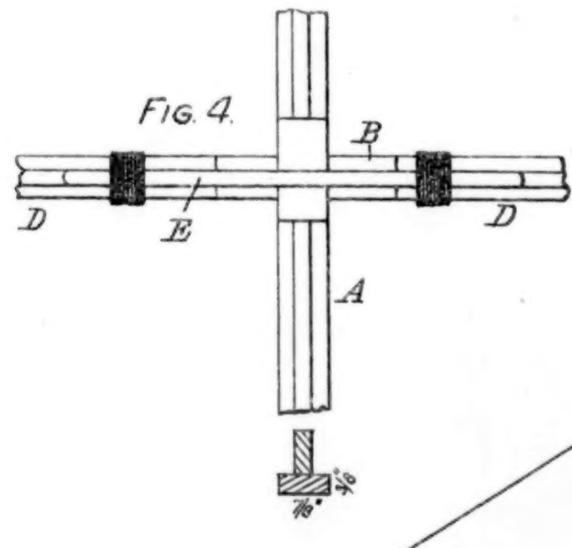


FIG. 2.

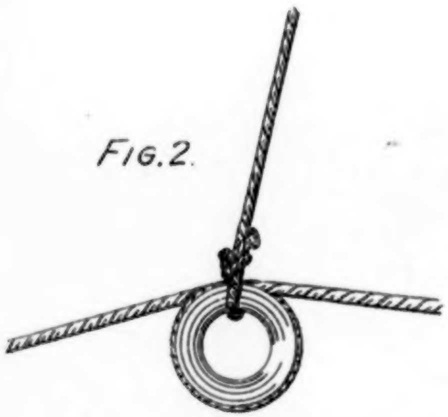
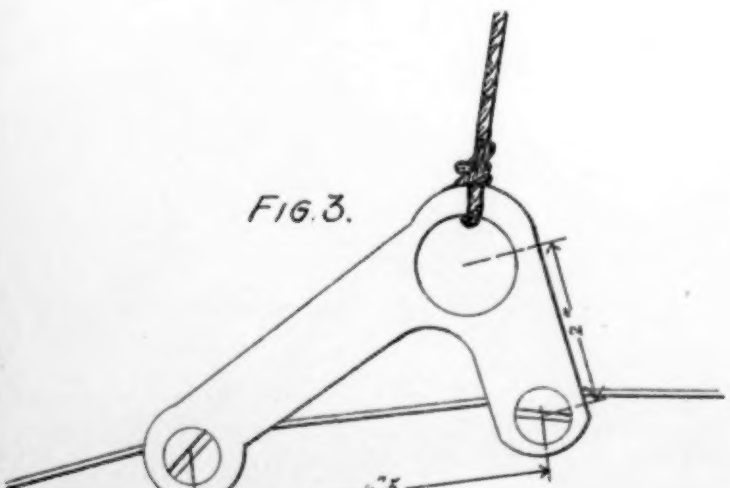


FIG. 3.



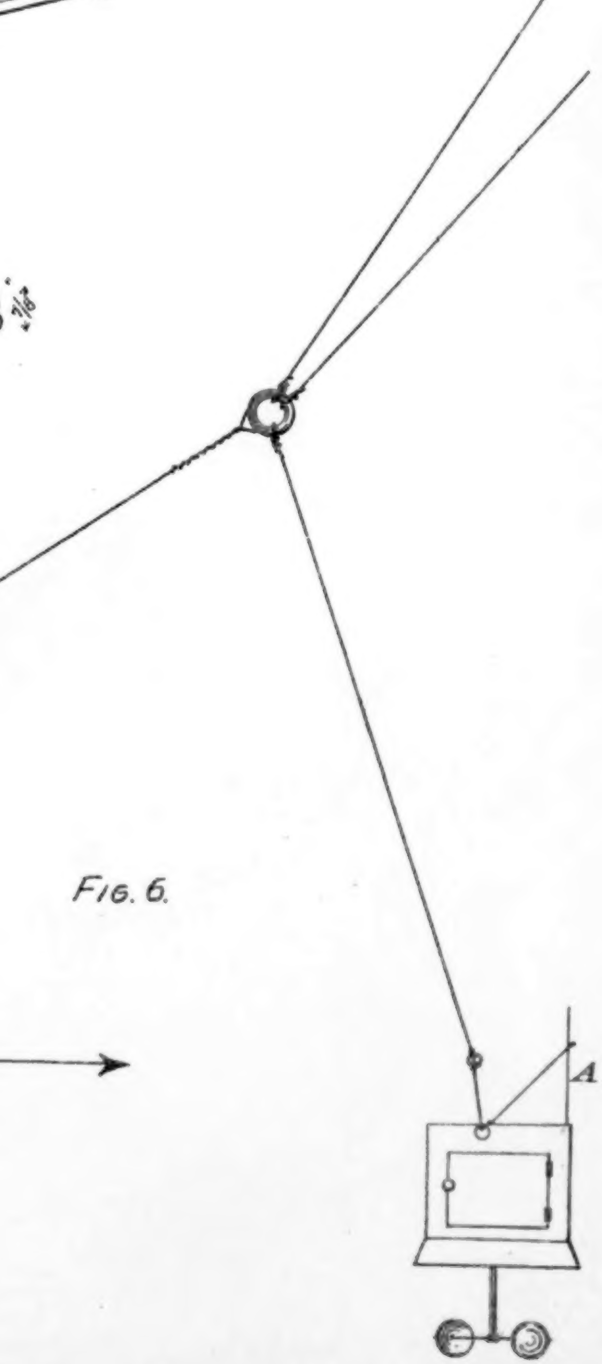


FIG. 6.